2019

Part-II

HISTORY

(Honours)

Paper – V

Full Marks – 90

Time : 4 Hours

The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answers wherever necessary.

Group – A

Answer any **two** questions : 15×2

1. Describe the expansion of Maratha Power under the first three Peshwas. Discuss the reasons for the failure of the Marathas to establish a strong empire.

2. How would you assess the role of Rammohan Roy in the cultural and social life of modern Bengal?

22. What is the 'Safety-valve' theory about the founding of the Indian National Congress?

23. Why was the Swarajya Party formed?

24. What is the significance of the term 'harijan' in Indian history.

25. Write a short note on the Cabinet Mission.

26. What are the main features of the Indian Constitution?

বঙ্গানুবাদ

বিভাগ – ক

যে কোনো দুটি প্রশ্নের উত্তর দাও : ১৫×২

১) প্রথম তিনজন পেশোয়ার নেতৃত্বে মারাঠা শক্তির প্রসার সম্পর্কে আলোচনা কর। কেন মারাঠারা একটি শক্তিশালী সাম্রাজ্য স্থাপনে ব্যর্থ হয়?

২) আধুনিক বাংলার সাংস্কৃতিক ও সামাজিক জীবনে রামমোহন রায়ের ভূমিকা তুমি কিভাবে মূল্যায়ন করবে?

৩) ব্রিটিশ প্রবর্তিত ভূমিরাজস্ব ব্যবস্থার মূল বৈশিষ্ট্যগুলি বর্ণনা কর। গ্রামীন অর্থনীতির ওপর এগুলির প্রভাব কি হয়েছিল?

৪) ১৮৫৭ সালের মহাবিদ্রোহের প্রকৃতি নিয়ে যে বিতর্ক রয়েছে তার ওপর একটি রচনা লেখ।

৫) মুসলিম সম্প্রদায়ের আধুনিকীকরণে স্যার সৈয়দ আহমেদ্ খানের ভূমিকা বর্ণনা কর।

৬) স্বাধীন ভারতে সংসদীয় গণতন্ত্রের প্রতিষ্ঠা ও প্রসারের জন্য জওহরলাল নেহেরুর অবদানের মূল্যায়ন কর।

৭) ইংরেজ ইস্ট ইণ্ডিয়া কোম্পানী কিভাবে আয়ুধ অধিকার করেছিল?

৮) সংক্ষেপে লর্ড কর্ণওয়ালিসের বিচারবিভাগীয় সংস্কার আলোচনা কর।

বিভাগ – খ

যে কোনো পাঁচটি প্রশ্নের উত্তর দাও ঃ ৮×৫

৯) ১৭৮৪-র পিটের ভারত আইনের কারণ ও তাৎপর্য সংক্ষেপে আলোচনা কর।

১০) ইংরেজরা দক্ষিণ ভারতের একটি রায়তওয়ারী ভূমিরাজস্ব ব্যবস্থা অবলম্বন করেছিল কেন?

১১) অবশিল্পায়ন বলতে কী বোঝ? ১৯ শতাব্দীর ভারতে অবশিল্পায়ন কি সত্যিই ঘটেছিল?

১২) উনবিংশ শতকের দ্বিতীয়ার্ধে সাঁওতাল বিদ্রোহের কারণগুলি কী কী ছিল? কেন তা ব্যর্থ হয়?

১৩) স্বরাজ্যপন্থী কারা ছিলেন? জাতীয়তাবাদী আন্দোলনে তাদের ভূমিকা আলোচনা কর।

১৪) আজাদ হিন্দ বাহিনীর গঠন ও কার্যাবলী বর্ণনা কর।

১৫) তেলেঙ্গানা আন্দোলন সংক্ষেপে আলোচনা কর।

১৬) স্বাধীন ভারত প্রসঙ্গে পরিকল্পিত অর্থনীতি বলতে কী বোঝায়?

বিভাগ – গ

যে কোন পাঁচটি প্রশ্নের উত্তর দাও ঃ ৫×২

১৭) প্রাচ্যবাদ বলতে কী বোঝায়?

১৮) রায়তওয়ারি ব্যবস্থা বলতে কী বোঝ?

১৯) বাংলা প্রদেশে ফকির ও সন্ন্যাসী বিদ্রোহ কী ছিল?

২০) উডের (১৮৫৪) নির্দেশনামার গুরুত্ব কী ছিল?

২১) খিলাফৎ বলতে কি বোঝায়?

২২) জাতীয় কংগ্রেসের প্রতিষ্ঠা সম্পর্কে 'সেফ্‌টি-ভাল্ব' তত্ত্ব কী?

২৩) স্বরাজ্য দল কেন গঠিত হয়েছিল?

২৪) ভারতের ইতিহাসে 'হরিজন' শব্দটির গু(ত্ব নির্ণয় কর।

২৫) ক্যাবিনেট মিশন সম্পর্কে সংক্ষিপ্ত টীকা লেখ।

২৬) ভারতের সংবিধানের প্রধান বৈশিষ্ট্যগুলি কী কী?

২১) ফ্রান্সিস বেকন সম্পর্কে সংক্ষিপ্ত টীকা লিখ।

২২) "কাউন্সিল অফ ট্রেন্টের" তাৎপর্য কি?

২৩) "ডিয়েট অফ ওয়ার্মস ১৫২১" এর তাৎপর্য কি?

২৪) "এডিক্ট অফ নান্টেস ১৫৯৮" এর তাৎপর্য কি?

২৫) ১৫৫৯-এর অ্যাঙলিকান চার্চ সেটেলমেন্টের তাৎপর্য কি?

২৬) মানুষের শরীর বিদ্যায় বৈজ্ঞানিক জ্ঞানের ক্ষেত্রে উইলিয়াম হার্ভের অবদান কি?

2019

Part-II

HISTORY

(Honours)

Paper – IV

(A + B)

Full Marks – 90

Time : 4 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

PAPER – IV-A

Group – A

Answer any **two** questions : 15×2

1. Discuss the significance of the coronation of Charlamaigne.
2. "The Holy Roman Empire reached its apogee in the reign of emperor Henry III" – Do you agree?
3. Do you think that the reign of Louis IX marked the climax of monarchy in medieval France ?

বঙ্গানুবাদ

বিভাগ – ক

যে কোন দুটি প্রশ্নের উত্তর দাও ঃ ১৫×২

১) শার্লামেনের অভিষেকের তাৎপর্য্য আলোচনা কর।

২) "The Holy Roman Empire reached its apogee in the reign of emperor Henry III" – তুমি কি এ বিষয়ে একমত?

৩) তুমি কি মনে কর মধ্যযুগীয় ফ্রান্সে নবম লুই-এর রাজত্বকাল রাজতন্ত্রের শিখরে পৌঁছেছিল?

৪) খৃষ্টান জগতের উপর পোপতন্ত্রের প্রাধান্য প্রতিষ্ঠার ক্ষেত্রে তৃতীয় ইনোসেন্ট কি কি সমস্যার সম্মুখীন হয়েছিলেন? কিভাবে সেগুলি সামাল দিয়েছিলেন?

৫) মধ্যযুগে ম্যানরীয়াল ব্যবস্থার বিকাশ ব্যাখ্যা কর।

৬) দ্বাদশ শতকের নবজাগরণের ওপর প্রবন্ধ লেখ।

বিভাগ – খ

যে কোন পাঁচটি প্রশ্নের উত্তর দাও ঃ ৮×৫

৭) ভার্দুন চুক্তির তাৎপর্য কি ছিল?

৮) ইউরোপে সেরামেন ও ম্যাগিয়ার অভিযানের কি কি প্রভাব ছিল?

৯) ইনভেস্টিচার দ্বন্দ্বে পোপ ৭ম গ্রেগরী ও ৪র্থ হেনরীর মধ্যে বিবাদের কারণগুলি কি কি ছিল?

১০) স্কুলমেন কারা? মধ্যযুগে বিভিন্ন বিশ্ববিদ্যালয়ের উদ্ভবে এদের অবদান আলোচনা কর।

১১) স্কলাস্টিক দর্শনের ওপর একটি সংক্ষিপ্ত রচনা লেখ।

১২) মধ্যযুগীয় গিল্ড সিস্টেমের ওপর একটি সংক্ষিপ্ত রচনা লেখ।

১৩) ফ্রান্স ও ইংল্যান্ডে কেন জাতীয় রাজতন্ত্র গড়ে উঠেছিল? কিন্তু কেন জার্মানী ও ইতালীতে নয়?

১৪) প্রথম অটো কিভাবে রোমান সাম্রাজ্যের পুনরুত্থান ঘটিয়েছিলেন?

১৫) ফ্রেডারিক বার্বারোসার জার্মান নীতি সংক্ষেপে আলোচনা কর।

১৬) লুই পায়াস কেন খ্রীষ্টীয় নীতির ভিত্তিতে সাম্রাজ্য তৈরী করতে পারেন নি?

বিভাগ—গ

যে কোন পাঁচটি প্রশ্নের উত্তর দাও ঃ ৫×৪

১৭) ভার্দুনের চুক্তি (843) সম্পর্কে একটি টীকা লেখ।

১৮) সামন্ততন্ত্রে লর্ড ও ভ্যাসালের সম্পর্ক কেমন ছিল?

১৯) কনকরড্যাট অফ্ ওয়ার্মস্ বলতে কি বোঝ?

২০) হোহেনস্টুফেন কারা ছিল?

২১) দ্বাদশ ও তৃতীয় শতাব্দীতে ফ্ল্যাণ্ডার্স কেন বিখ্যাত হয়েছিল?

২২) সেন্ট বেনেডিক্ট-এর নীতি বলতে কি বোঝ?

২৩) রোজার বেকন সম্পর্কে যা জান লিখ।

২৪) ডোমিনিকান কারা?

২৫) শ্যাম্পেন বাণিজ্য মেলার সংক্ষিপ্ত বর্ণনা দাও।

২৬) লোম্বার্ড লীগ সম্পর্কে টীকা লেখো।

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PAPER – IV-B

Group – A

Answer any **two** questions : 15×2

1. "Feudalism Collapsed in Western Europe because of its own internal contradictions" – Explain the statement.
2. How did Jacob Burckhardt interpret the Renaissance in Italy? What are the criticisms of that interpretation?
3. Discuss the Reformation in England. In what ways was the Reformation in England different from that in the continent?
4. What was the 'Transition Debate'? In this regard explain the main arguments of Maurice Dobb and Pawl Sweezy. 10+5
5. Was there a connection between reformation movement and Printing revolution?
6. What do you understand by the term chartered Monopoly Trading Company in the context of European history? When did they originate and why?

2019

B.A.

3rd Semester Examination

HISTORY (Honours)

Paper - C 7-T

Full Marks : 60 Time : 3 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group-A

Answer *any ten* questions : 2×10=20

1. What is the historical importance of 'Babarnama' ?
2. What was the significance of the Batle of Khanua ?
3. Why is 'Ain-i-Akbari' important ?
4. What is 'Sulh-i-Kul' ?
5. Who was Bairam Khan ?
6. Who was Faizi ?

24. Why did Akbar introduce the Mansabdari system ? Describe its significance.

25. Discuss the condition of the trade and commerce in Mughal Period. Comment on the position of the merchants during the period of your study.

বঙ্গানুবাদ

বিভাগ-ক

যে-কোনো দশটি প্রশ্নের উত্তর দাও : ২×১০=২০

১। 'বাবরনামা' গ্রন্থটির ঐতিহাসিক গুরুত্ব কি?

২। খানুয়া যুদ্ধের তাৎপর্য কী?

৩। 'আইন-ই-আকবরি' গুরুত্বপূর্ণ কেন?

৪। 'Sulh-i-Kul' কি?

৫। বৈরাম খাঁ কে ছিলেন?

৬। ফৈজি কে ছিলেন?

৭। আকবরের ভূমি রাজস্ব ব্যবস্থার তিনটি উল্লেখযোগ্য বৈশিষ্ট্য লেখ।

৮। রানী দুর্গাবতী কে ছিলেন?

৯। সুরাটের উত্থানের জন্য দায়ী এমন যে কোন একটি কারণ চিহ্নিত কর।

১০। মুঘল ভারতের দুটি বন্দরের নাম কর।

১১। মুঘল যুগের যে-কোন দুজন সুফি সন্তের নাম কর।

১২। আকবর নির্মিত দুটি স্থাপত্য সৌধের নাম উল্লেখ কর।

১৩। মুঘল ভারতের ইতিহাস রচনায় পারসিক লেখগুলি কতদূর গুরুত্বপূর্ণ?

১৪। 'মাদাদ-ই-মাশ' কী?

১৫। 'ইবাদৎ খানা' কী ছিল?

বিভাগ-খ

যে কোনো **চারটি** প্রশ্নের উত্তর দাও ঃ ৫×৪=২০

১৬। ভারতে কিভাবে মুঘল শাসন প্রতিষ্ঠিত হয়?

১৭। আকবরের দাক্ষিণাত্য নীতির সমালোচনামূলক বর্ণনা কর।

১৮। বদায়ুনী সম্পর্কে যা জান লেখ।

১৯। মুঘল চিত্রকলা ও স্থাপত্য সম্পর্কে সংক্ষিপ্ত বিবরণ দাও।

২০। মুঘল অভিজাত শ্রেণীর বিবর্তন সন্ধান কর।

২১। মুঘল যুগের গ্রামীণ সমাজ সম্পর্কে একটি সংক্ষিপ্ত টীকা লিখ।

বিভাগ-গ

যে-কোনো দুটি প্রশ্নের উত্তর দাও ঃ ১০×২=২০

২২। মুঘল সাম্রাজ্য বিস্তারে আকবর কী ভূমিকা গ্রহণ করেছিলেন?

২৩। রাষ্ট্র এবং ধর্ম সম্পর্কে আকবরের অবস্থান কী ছিল?

২৪। আকবর কেন মনসবদারী ব্যবস্থা প্রবর্তন করেছিলেন? ইহার গুরুত্ব কী?

২৫। মুঘল যুগে ব্যবসা-বাণিজ্যের অবস্থার বিবরণ দাও। এই যুগের বণিকরা কেমন মর্যাদা ভোগ করতেন?

Using the Present Value method evaluate the projects. ৮

(ঙ) নিম্নলিখিত বিষয়গুলির উপর টীকা লেখ :

(i) Zero base Budget,

(ii) চলতি মূলধনের বিভিন্ন ধারণা। ৪+৪

(চ) হিসাব সংক্রান্ত অনুপাত কাকে বলে? ব্যবস্থাপক, বিনিয়োগকারী এবং উত্তমর্ণদের কাছে হিসাব সংক্রান্ত অনুপাতের ব্যবহারগুলি আলোচনা কর। ২+৬

৬। যেকোনো *দুইটি* প্রশ্নের উত্তর দাও : ২×৩

(ক) "অবচয় কি তহবিলের উৎস?" ব্যাখ্যা কর।

(খ) ফার্মগুলির মধ্যে তুলনা বলতে কি বোঝ?

(গ) পরিবর্তনশীল বাজেটের ধারণাটি আলোচনা কর।

(ঘ) কিছু ত্রুটি থাকা সত্ত্বেও প্রত্যার্পণকাল পদ্ধতি কেন ব্যবহৃত হয়?

(ঙ) P. Co. invests Rs. 20,00,000 in a project. The scrap value after its useful life 7 years is over, estimated to be Rs. 2,00,000. Earning after tax (Rs. in lakhs) are :

Year	1	2	3	4	5	6	7
Earnings after Tax (Rs.)	2	2.3	1.9	2.5	3.0	2.2	4.0

Compute ARR (Accounting Rate of Return).

[অভ্যন্তরীন মূল্যায়ণ — ১০ নম্বর]

2019

Part–III

FINANCIAL MANAGEMENT AND MANAGEMENT ACCOUNTING

(Honours in Accounting & Finance)

PAPER—AH-7

Full Marks : 100

Time : 4 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Group – A

(Financial Management)

[Marks : 45]

1. Answer any *one* question : 1×15

(a) Define Financial Management. Explain the objectives of Financial Management. 3+12

Working capital return back at the end of Project life	2,000	2,000

Present value of Re 1 to be received at the end of each year at 10% p.a. is given below :

Year	1	2	3	4	5
P.V.	.909	.827	.751	.683	.621

Using the Present Value method evaluate the projects. 8

(e) Write a note on the following :

(i) Zero base Budget,

(ii) Different concepts of working capital. 4+4

(f) What is 'Accounting Ratio'? Describe the uses of the accounting ratio to management, investors and creditors. 2+6

6. Answer any *two* questions : 2×3

(a) 'Is Depreciation a source of fund'? Discuss.

(b) What is inter firm comparison?

(c) State the concept of flexible budget.

(d) Why payback period method is used though it has some shortcomings?

(e) P. Co. invests Rs. 20,00,000 in a project. The scrap value after its useful life 7 years is over, estimated

to be Rs. 2,00,000. Earning after tax (Rs. in lakhs) an :

Year	1	2	3	4	5	6	7
Earnings after Tax (Rs.)	2	2.3	1.9	2.5	3.0	2.2	4.0

Compute ARR (Accounting Rate of Return).

[Internal Assessment — 10 Marks]

বঙ্গানুবাদ

দক্ষিণ প্রান্তস্থ সংখ্যাগুলি প্রশ্নমান নির্দেশক।

পরীক্ষার্থীদের যথাসম্ভব নিজের ভাষায় উত্তর দেওয়া প্রয়োজন।

বিভাগ—ক

(আর্থিক ব্যবস্থাপনা)

পূর্ণমান - ৪৫

১। যেকোনো *একটি* প্রশ্নের উত্তর দাও : ১×১৫

(ক) আর্থিক ব্যবস্থাপনা কাকে বলে? আর্থিক ব্যবস্থাপনার উদ্দেশ্যগুলি ব্যাখ্যা কর। ৩+১২

(খ) মূলধনের বিভিন্ন উৎসগুলি কি কি? যেকোনো দুটি উৎসের সুবিধা ও অসুবিধাসহ ব্যাখ্যা কর। ৩+৬+৬

(গ) (i) নিরপেক্ষ বিন্দু কাকে বলে?

(ii) BT Ltd. has only Rs. 10,00,000 equality share

capital of Rs. 100 per share in its capital structure. The company needs another Rs. 10,00,000 for its expansion scheme. It has the following two alternative financial plans :

Plan I : Issue equity shares only (Rs. 100 each)
Plan II : Issue 10% Debenture of Rs. 10,00,000.

Corporate tax rate is 40%

Compute :

(a) Indifference Point.

(b) EPS.

(c) If the EBIT is 25% above indifference point, then which plan will be better ?

২+৪+৪+৫

২। যেকোনো *তিনটি* প্রশ্নের উত্তর দাও : ৩×৮

(ক) ইকুইটি শেয়ার এবং প্রেফারেন্স শেয়ারের মধ্যে পার্থক্য নিরূপণ কর।

(খ) From the following information of TC Ltd. Calculate Cost of Equity and Cost of Debenture :

(i) Equity Shares are quoted in the market at Rs. 20 and the company pays a dividend of Re 1 per share. The inventors' market expects a growth rate of 5% per year.

(ii) 10% Debentures are issued at a discount of 10% of Rs. 10,000 to be redeemed after 10 years at a premium of 10%. The company is in the tax bracket of 35%. ৪+৪

(গ) কার্যকরি ইজারা এবং আর্থিক ইজারার মধ্যে পার্থক্য কি কি?

(ঘ) (i) লভ্যাংশ নীতির ক্ষেত্রে গর্ডন মডেলের অনুমানগুলি বিবৃত কর।

(ii) From the following informations calculate market price of share by using Gordon's Model :

Total investment in assets	Rs. 5,00,000
No. of shares	25,000
Total earnings	Rs. 1,00,000
Cost of capital	16%
Dividend payout ratio	40%

৪+৪

(ঙ) ডেভিড ডুরান্ড দ্বারা প্রদত্ত NI (Net Income) ধারণাটি ব্যাখ্যা কর।

(চ) (i) অর্থের সময় মূল্যের সংজ্ঞা দাও।

(ii) Mr. AG has at present Rs. 1,00,000 in his hand. For investment purposes two options are available to him :

Option I : Invest @ 9% p.a. compounded half-yearly for 7 years.

Option II : Invest @ 9.5% p.a. compounded yearly for 7 years.

Which option should he choose ? ২+৬

৩। যেকোনো দুইটি প্রশ্নের উত্তর দাও : ২×৩

(ক) Levered firm এবং Unlevered firm কাকে বলে?

(খ) পরিবর্তন যোগ্য ঋণপত্র বলতে কি বোঝ?

(গ) CD Ltd. issues 15% Redeemable Preference Shares of Rs. 100 each. Preference shares are repayable after 10 years. Floation cost is 5%. Compute cost of Preference Shares, if the shares are issued at par but redeemed at a premium of 10%.

(ঘ) নিম্নলিখিত তথ্যগুলি থেকে বিক্রয়মূল্য নির্ধারণ কর :
DOL = 2, DFL = 3, Interest — Rs. 3,00,000
Contribution — 40% of sales.

(ঙ) ব্যক্ত এবং অব্যক্ত পরিব্যয়ের মধ্যে পার্থক্য দেখাও।

২।

বিভাগ—খ

(পরিচালন হিসাবরক্ষণ)

পূর্ণমান - ৪৫

৪। যেকোনো *একটি* প্রশ্নের উত্তর দাও : ১×১৫

(ক) পরিচালন হিসাবরক্ষণের উদ্দেশ্য এবং পরিধি আলোচনা কর। ৮+৭

(খ) From the following information of DS Ltd. and Balance Sheets. Prepare (i) a statement showing change in working capital and (ii) Fund Flow Statement for the year ended 31.12.2018 :

(Continued)

Balance Sheets of DS Ltd.
for the year ended 31.12.2017 and 31.12.2018

Liabilities	*2017 Rs.*	*2018 Rs.*	*Assets*	*2017 Rs.*	*2018 Rs.*
Equity Share Capital	1,20,000	1,80,000	Goodwill	25,000	20,000
6% Redeemable Preference Share Capital	50,000	30,000	Land & Building	80,000	70,000
General Reserve	12,000	15,000	Plant & Machinery	40,000	65,000
Capital Reserve	2,000	16,000	Trade Investment	4,000	49,000
Profit & Loss A/c	7,200	12,000	Stock	30,000	40,000
Sundry Creditors	10,000	20,000	Sundry Debtors	28,000	34,000
Bills Payable	5,000	4,000	Bills Receivable	15,000	28,000
Outstanding Liabilities	2,000	1,000	Cash	7,200	10,000
Provision for Tax	12,000	20,000	Preliminary Expenses	7,000	4,000
Proposed Dividend	16,000	22,000			
	2,36,200	3,20,000		2,36,200	3,20,000

Other particulars :

(i) Depreciation written off on Plant & Machinery for the year 2018 is Rs. 6,000. During the year a machinery, the book value of which was Rs. 12,000 was sold for Rs. 9,000.

(ii) No depreciation had been charged on Land & Building. Profit earned on sale of a plot of land for Rs. 24,000 was transferred to Capital Reserve.

(iii) Dividend distributed during the year amounted to Rs. 14,000. ৫+১০

(গ) (i) বাজেট কাকে বলে?

(ii) বাজেটমূলক নিয়ন্ত্রণের গুরুত্ব আলোচনা কর।

(Turn Over)

(iii) বাজেট রচনার ক্ষেত্রে কোন কোন অপরিহার্য উপাদান বিবেচনা করা হয়? ২+৫+৮

৫। যেকোনো *তিনটি* প্রশ্নের উত্তর দাও : ৩×৮

(ক) The management of JKS Ltd. has called for a statement showing the working capital needed to finance a level of activity of 3,00,000 units of output for the year. The cost structure per unit for the company's product is given below :

Raw Materials — Rs. 20 ; Direct Labour — Rs. 5 ; Overheads — Rs. 15 ; Profit — 25% on cost.

Past trends indicate that raw materials are held in stock on an average for 2 months. Processing time will be half a months.

Finished goods remain in store for a month. Suppliers of material extends one month credit whereas two months credit is allowed to debtors. Lag in payment of wage and overhead is $^1/_4$ month (one week). A minimum cash balance of Rs. 25,000 is expected to be maintained. 40% of sales are in cash and production is carried on evenly throughout the year.

Prepare a statement showing of working capital requirement of JKS Ltd. ৮

(খ) With the help of following information as provided by SD Ltd. prepare a Balance Sheet on 31.12.18.

Fixed Assets — Rs. 6,00,000 ; Working Capital — Rs. 4,00,000 ; Working Capital Ratio — 2 ; Fixed Assets Turnover Ratio — 4 ; Gross Profit Ratio — 25% ; Debtors' Turnover — 1.5 months ; Creditors' Turnover — 2 months ; Stock Turnover — 2 months ; Net Profit Ratio — 5% ; Reserve — $^2/_3$ of Net Profit ; Capital Gearing Ratio — 1:1 (using long term loan). ৮

(Continued)

(গ) আর্থিক হিসাবরক্ষণ এবং পরিচালন হিসাবরক্ষণের মধ্যে পার্থক্য কি? ৮

(ঘ) Worship Ltd. can make either of the two investments at the begining of 2019. Assume a required rate of return of 10% p.a. The particulars relating to the projects are given below :

	Project I Rs.	Project II Rs.
Initial outlay	40,000	56,000
Estimated life	5 years	5 years
Scrap value	NIL	NIL
Net cash flows at the end of		
2019	8,000	15,000
2020	10,000	17,500
2021	12,000	15,000
2022	18,000	15,000
2023	10,000	15,000
Additional working capital	2,000	2,000
Working capital return book at the end of project life	2,000	2,000

Present value of Re 1 to be received at the end of each year at 10% p.a. is given below :

Year	1	2	3	4	5
P.V.	.909	.827	.751	.683	.621

(c) Solve the game problem by simplex method :

		B		
		1	–1	3
A		3	5	–3
		6	2	–2

11. Answer any **one** question : 4×1

(a) Solve graphically the following game problem

		B			
		B_1	B_2	B_3	B_4
A	A_1	6	5	2	3
	A_2	1	2	6	3

(b) Prove that if a constant be added to any row or any column of the cost matrix of an assigment problem then the resulting assignment problem has the same optimal solution as the original problem.

2019

Part – II

MATHEMATICS

(Honours)

Paper-III

[New Syllabus]

Full Marks - 90

Time : 4 Hours

The Questions are of equal value for any group/half.
The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answers wherever necessary.

Group – A

(Vector Analysis)

Marks : 25

1. Answer any **one** question : 8×1

(a) (i) Let $\vec{a},\vec{b},\vec{c}$ and $\vec{d}$ be four vectors. Prove that

$$(\vec{a}\times\vec{b}).(\vec{c}\times\vec{d})+(\vec{b}\times\vec{c}).(\vec{a}\times\vec{d})+(\vec{c}\times\vec{a}).(\vec{b}\times\vec{d})=0$$

Hence deduce that

$$\sin(\alpha-\beta)\sin(\alpha+\beta)=\sin^2\alpha-\sin^2\beta$$

(ii) Find the projection of $\vec{a} = 2\hat{i} + \hat{j} - 3\hat{k}$ on $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$. (3+3+2)

(b) (i) State and prove Green's theorem.

(ii) Find the directional derivative of A^2, where $\vec{A} = xy^2\hat{i} + zy^2\hat{j} + xz^2\hat{k}$ at the point (2,0,3) in the direction of the outward normal to the curve $x^2 + y^2 + z^2 = 14$ at the point (3, 2, 1). 4+4

2. Answer any **three** questions : 4×3

(a) Verify divergence theorem for $\vec{A} = 4x\hat{i} - 2y^2\hat{i} + z^2\hat{k}$ taken over the region bounded by $x^2 + y^2 = 4$, $z = 3$ and $z = 6$.

(b) Show that the Frenet Serret formula can be expressed as $\frac{d\hat{t}}{ds} = \vec{w} \times \hat{t}$, $\frac{d\hat{n}}{ds} = \vec{w} \times \hat{n}$, $\frac{d\hat{b}}{ds} = \vec{w} \times \hat{b}$ where $\vec{w}$ is to be found by you.

(c) Evaluate $\iint_S \vec{A}.\hat{n}ds$, where $\vec{A} = 2x\hat{j} + y\hat{i} - z\hat{k}$ and S is the surface of the plane $2x + y = 6$ included in the first octant cut off by the plane $z = 4$.

(d) A force of 15 units acts is the direction of the vector $\hat{i} - 2\hat{j} + 2\hat{k}$ and passes through a point $2\hat{i} - 2\hat{j} + 2\hat{k}$, Find the moment of the force $\hat{i} + 2\hat{k}$ anout the point $\hat{i} + \hat{j} + \hat{k}$.

(e) If $\vec{A}$ be a vector point function defined in the region enclosed by a surface S such that its finite order partial derivatives be finite, single valued and continuous throughout V and S, then $\iiint_V (\vec{\nabla} \times \vec{A}) dv = \iint_S (\hat{n} \times \vec{A}) ds$ $\hat{n}$ has usual meanings.

3. Answer any **one** question : 3×1

(a) For the space curve $x = t$, $y = t^2$, $z = \frac{2}{3}t^3$, determine the curvature at the point where $t = 1$.

(b) Show that if $\phi(x, y, z)$ is any solution of Laplace's equation, then $\vec{\nabla}\phi$ is a vector which is both solenoidal and irrotational.

4. Answer any **one** question : 2×1

(a) State the Divergence Theorem of Gauss in vector Integration.

(b) Find the equation of the plane containing the line $\vec{r} = t\vec{\alpha}$ and is perpendicular to the plane containing the lines $\vec{r} = t_1\vec{\beta}$ and $\vec{r} = t_2\vec{\gamma}$.

Group - B

(Analytical Geometry-3D)

30 Marks

5. Answer any **one** question : 15×1

(a) (i) Show that the equation to the plane containing the straight line

$\frac{y}{b}+\frac{z}{c}=1,\ x=0$

and parallel to the straight line

$\frac{x}{a}-\frac{z}{c}=1,\ y=0$ is $\frac{x}{a}-\frac{y}{b}-\frac{z}{c}+1=0$ and if 2d be the shortest distance between the lines, then show that

$\frac{1}{d^2}=\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}$

(ii) Reduce the equation

$x^2+y^2+z^2-2yz+2zx-2xy+x-4y+z+1=0$

to the cononical form and state the nature of the surface.

(b) (i) Show that the generators of the hyperboloid

$\frac{x^2}{25}+\frac{y^2}{16}-\frac{z^2}{4}=1$ which are parallel to the plane $4x-5y-10z+7=0$ are

$x+5=0,\ y+2z=0$ and $y+4=0,\ 2x=5z$

(ii) Find the locus of the vertices of the right circular cones that pass through the elipse

$\frac{x^2}{a^2}+\frac{y^2}{b^2}=1,\ z=0,$

6. Answer any **one** question : 8×1

(a) The plane $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$ meets the coordinate axes in A, B, C. Find the equation of the cone generated by lines drawn from origin to meet the circle ABC.

(b) Find the equation of the sphere having the circle $x^2+y^2+z^2=9,\ x-2y+2z=5$ for a great circle, Also determine its centre and radius.

7. Answer any **one** question : 4×1

(a) Let the perpendiculars SL, SM, SN be drawn from the point S (a, b, c) to the co-ordinate planes. Find the equation of the plane LMN.

(b) Find the equation to the right circular cylinder whose radius is 5 and whose axis is

$\frac{x-y}{2}=\frac{y-2}{3}=\frac{z-3}{4}$

8. Answer any **one** question : 3×1

(a) Find the shortest distance between the lines $x=y=z$ and $x+y=z,\ z-x=2$

(b) Find the position of the center of the conicoid

$14x^2+14y^2+8z^2-4yz-4zx-8xy+18x-18y+5=0$

Group - C

(LPP and Game theory)

35 Marks

9. Answer any **one** question. 15×1

(a) (i) Prove that every extreme point of the convex set of all feasible solutions of the system Ax = b, $x \geq 0$ corresponds to a basic feasible solutions. 8

(ii) Solve the following LPP : 7

Maximize $z = 2x_1 - 3x_2$

s. t. $x_1 \leq 4$

$x_2 \leq 6$

$x_1 + x_2 \leq 5$

$-x_2 \leq -1$

$x_1, x_2 \geq 0$

(b) (i) $x_1 = 2, x_2 = 3, x_3 = 1$ is a feasible solution of the following LPP : 7

Maximize $z = x_1 + 2x_2 + 4x_3$

s. t. $2x_1 + x_2 + 4x_3 = 11$

$3x_1 + x_2 + 5x_3 = 14$

$x_1, x_2, x_3 \geq 0$

(ii) Find BFS :

If x be any feasible solution to the primal problem Max $z = CX$, $AX \leq b$, $X \geq 0$ and V be any feasible solution to the dual problem then prove that $CX \leq b^T V$ 8

10. Answer any **two** question 8 × 2

(a) Using two phase method, solve the LPP :

Min. $z = 3x_1 + 2x_2$

s.t. $2x_1 + x_2 \geq 14$

$2x_1 + 3x_2 \geq 22$

$x_1 + x_2 \geq 1$

$x_1, x_2 \geq 0$

(b) Find the minimum cost of transportation problem :

	D_1	D_2	D_3	a_i
O_1	4	3	2	10
O_2	1	5	0	13
O_3	3	8	6	12
bj	8	5	4	

Symbols have their useual meanings.

(iii) Use Laplace transform to solve the following differential equation

$y'' + 2y' + 2y = 2,\ y(0) = 0,\ y'(0) = 1$ 5

7. Answer any **one** question : 3×1

(a) Locate and classify the singular points of the equation $x^3(x-1)y'' + 2x^4y' + 4y = 0$. 3

(b) Form a Partial Differential Equation by eleminating the function f from $z = xf\left(y/x\right)$ 3

8. Answer any **one** question : 2×1

(a) Evaluate $L^{-1}\left\{\int_0^\infty \frac{1}{p(p+1)}dp\right\}$

(b) What is semi-linear partial differential equation? Give an example. 2

2019

Part-II

MATHEMATICS

(Honours)

Paper-IV

[New Syllabus]

Full Marks - 90

Time : 4 Hours

The Questions are of equal value for any group/ half. The figures in the right-hand margin indicate marks.Candidates are required to give their answers in their own words as far as practicable. Illustrate the answers wherever necessary.

Group – A

(Analytical Dynomics of Particles)

Marks : 40

1. Answer any **one** question : 1×15

(a) (i) A particle of mas m on a straight line is attrached towards the origin on it with a force $m\mu$ times the distance from it and the

resistance to motion at any point is mk times the square of the velocity there. If it starts from rest at a distance 'a' from the origin, prove that it will come to rest again at a distance 'b' from the origin, where

$(1+2ak)e^{-2ak} = (1-2bk)e^{2bk}$ 8

(ii) Over a small smooth pulley is placed a uniform flexible cord, the later is initially at rest and lengths $\ell - a$ and $\ell + a$ hang down on two sides. The pulley is now made to move with contant upward accederation f. show that the string will leave the pully after time

$\sqrt{\frac{\ell}{f+g}} \cos h^{-1} \frac{\ell}{a}$ 7

(b) (i) A particle mover with a central acceleration $\mu\left(r + \frac{a^4}{r^3}\right)$ being projected from an apse at a distance a with a velocity $2a\sqrt{\mu}$, prove that its path is $r^2\left(2+\cos\sqrt{3}\theta\right) = 3a^2$ 8

(ii) If a planet was suddenly stopped in its orbit supposed circular, show that it would fall into the sun in a time which is $\sqrt{2}/8$ times the period of the planet's resolution. 7

2. Answer any **two** questions. 2×8

(a) A particle is acted on by a force parallel to the axis of y where acceleration is ky and is initially projected with a velocity $a\sqrt{k}$ parallel to the axis of x at a point where y = a; prove that it will describe a catenary.

(b) If the resistance varies as the velocity and the range on the horizontal plane through the point of projection is a maximum, show that the angle α which the direction of projection makes with the vertical is given by

$\frac{\lambda(1+\lambda\cos\alpha)}{\cos\alpha+\lambda} = \log(1+\lambda\cos\alpha)$ where λ is the ratio of the velocity of projection to the terrminal velocity.

(c) A spherical raindrop, falling freely, receives in each instant an increase of volume equal to λ times its surface area at that instant, show that the velocity at the end of time t and the distance fallen through in that time are respectively

$\frac{g}{4\lambda}\left[(a+\lambda t) - \frac{a^4}{(a+\lambda t)^3}\right]$ and $\frac{gt^2}{8}\left[\frac{2a+\lambda t}{a+\lambda t}\right]^2$

Where 'a' is the initial radius of th raindrop .

3. Answer any **three** questions : 3×3

(a) If v be the speed of a particle at any time t moving along x-axis and $v^2 = 4 - x^2$, then prove that the motion is S. H. M. Find the period of oscillation. 2+1

(b) A particle describes a parabola $y^2 = 4ax$ under a force which is directed perpendicular towards its axis, find the law of force. 3

(c) State Kepler's laws of planetary motion. 3

Group – B

(Analytical Statics)

Marks – 30

4. Answer any **three** questions. 3 × 8

(a) Three forces P, Q, R act along the sides of a triangle formed by the lines $x + y = 3$, $2x + y = 1$ and $x - y + 1 = 0$. Find the equation of the line of action of the resultent

(b) (i) Find the C. G. of the area enclosed by the curved $x^2 + y^2 = 2ax$ and $x^2 + y^2 = 2bx$ (b<a) on the 1st quadrant. 4

(ii) Four equal rods each of weight W form a rhombus ABCD with smooth hinges at the joints. The frame is suspended by the end A and a weight W′ is attached at C. A stiffening rod of negligible weights joins the middle points of AB, AD keeping these inclined at an angle α to AC. Show that the thrust on the stiffening rod is $(4W + 2W')\tan\alpha$. 4

(c) The ellipsoid $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ is placed with the axis of x vertical and its surface is rough. Show that a heavy particle will rest on it everywhere above its intersection with the cylinder $\frac{y^2}{b^2}\left(1+\frac{a^2}{b^2\mu^2}\right)+\frac{z^2}{c^2}\left(1+\frac{a^2}{\mu^2c^2}\right)=1$, where μ is the co-efficient of friction. 8

(d) State Principle of Virtual work for a particle. The middle points of opposite sides of a Quadrilate ral formed by four freely jointed weightless bars are

connected by two light rods of length 'a' and 'b' in a state of tension. If T_1 and T_2 be the tensions of those rods, prove that 1+7

$$\frac{T_1}{a} > \frac{T_2}{b} = 0$$

e) What are ment by stable unstable eqilibrium of a body. A Body rests in equilibrium on another fixed body there being enough fricition to prevent sliding. The position of the two bodies in contact are spherical of radii 'r' and 'R' and the line of joining their centres in the position of equilibrium is vertical. Show that the equilibrium is stable Provided

$$\frac{1}{h} > \frac{1}{r} + \frac{1}{R}$$

Where h is the height of C.G. of the upper body in position of equilibrium above the point of contact. 2+6

5. Answer any **two** questions : 3×2

(a) Discuss the significance of virial 3

(b) State laws of friction. 3

(c) Prove that for any given system of forces can have only one central anis. 3

Group – C
(Differential Equation-II)
Marks - 20

6. Answer any **one** question : 1×15

(a) (i) Find the power series solution of the initial value problem

$$4\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + y = 0 \quad \text{about } x = 2 \text{ with}$$

$$y(2) = 0,\ y'(2) = \frac{1}{e}$$ 8

(ii) State convolution theorem for Laplace Transformation. 2

(iii) Solve the following :

$$z(x + y)p + z(x - y)q = x^2 + y^2$$ 5

where $p = \frac{\partial z}{\partial x}$, $q = \frac{\partial z}{\partial y}$

(b) (i) Solve : $\frac{dx}{dt} + 4x + 3y = t$

$$\frac{dy}{dt} + 2x + 5y = e^t$$ 6

(ii) Using convolution theorem, evaluate

$$L^{-1}\left\{\frac{1}{p(p+1)^3}\right\}$$ 4

(b) Let V and W be vector spaces over a field F. If $T : V \to W$ be a linear mapping then prove that $\text{Im}T$ is a subspace of W. 2

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NEW

Part–III 3-Tier

2019

MATHEMATICS

(Honours)

PAPER—VIII

Full Marks : 60

Time : 4 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group—A

(Numerical Analysis)

[Marks : 25]

1. Answer any *two* questions : 2×8

(a) Describe the iteration process to find the real root of a function $f(x) = 0$ in $[a, b]$ and state the condition for which the iteration process converges with desire degree of accuracy. Find the condition of convergence of the iteration process. Show that the order of convergence of iteration process is linear.

(3+1)+2+2

(b) (i) What do you mean by 'round-off errors' in numerical data ? Show how these errors are propagated in a difference table ? 4

(ii) Define k-th order forward difference of a function $f(x)$. Prove that the nth order forward difference of a polynomial of degree n is constant. 1+3

(c) (i) Describe the iteration process to find the solution of a system of non-homogeneous equation $Ax = B$ where $A=[a_{ij}]_{n\times n}$, $X=[x_1, x_2, \ldots x_n]$ $B=[b_1, b_2, \ldots, b_n]$ and state its condition of convergence. What modification will be done if this condition is not satisfied ? 3+2

(ii) If $f(x)$ is a function such that $f(0) + f(b) = -107$, $f(1) + f(5) = -36$ and $f(2) + f(4) = -3$, find f(3). 3×3

2. Answer any *three* questions :

(a) State general error formula for the functional relation $u = f(x_1, x_2, \ldots x_n)$. Find the relative error of S where

$$S=\frac{a^2\sqrt{b}}{c^3} \quad \text{and} \quad a=6.54\pm0.01$$

$$b=48.64\pm0.02 \quad \text{and} \quad c=13.5\pm0.03$$ 1+2

(Continued)

(b) Write down the iterative formula of modified Euler method and state why it is better than Eular method. 2+1

(c) Describe pivoting process to find the solution of non-homogeneous equation in Gauss's Elimination method. 3

(d) Define 'degree of precision' of a numerical integration formula. What are it for Tapez-oidal rule and Simpson's 1/3 rule ? 2+1

(e) What is the principle for the numerical differentiation ? Deduce the differentiation formulae for computing first and second order derivative of a fluction $f(x)$ at the first interpolating point. 1+2

Group—B

(Real Analysis—III)

[Marks : 25]

3. Answer any *one* question : 1×15

(a) (i) Let $D \subset \mathbb{R}$ and for each $n \in N, f_n : D \to \mathbb{R}$ is continuous on D. If each f_n be continuous on D then show that the uniform convergence of the

(Turn Over)

sequence $\{f_n\}$ on D is a sufficient but not a necessary condition for continuity of the limit function on D. 3+2

(ii) Let $\sum a_n x^n$ be a power series with radius of convergence $R(>0)$. Let $f(x)$ be sum of the power series on $(-R, R)$. Then prove that $f(x)$ is continuous on $(-R, R)$. 5

(iii) If $f(x)$ be the sum of the series $e^{-x} + 2e^{-2x} + 3e^{-3x} + \ldots, x > 0$. Show that $f(x)$ is continuous for all $x > 0$.

Evaluate $\int_{\log_e^2}^{\log_e^3} f(x)dx$. 5

(b) (i) State and prove Cauchy's criteria for uniform convergence of the sequence of functions. 1+5

(ii) For the series $\sum_{n=1}^{\infty} f_n(x)$ where $f_n(x) = n^2 x e^{-n^2x^2} - (n-1)^2 x e^{-(n-1)^2x^2}$, $x \in [0,1]$. Show that $\sum_{1}^{\infty}\int_{0}^{1} f_n(x)dx \neq \int_{0}^{1}\left(\sum_{1}^{\infty} f_n(x)\right)dx$. Is the series $\sum_{1}^{\infty} f_n(x)$ uniformly convergent on [0, 1] ? 4+1

(iii) Show that the sequence of functions $\{f_n(x)\}$ where $f_n(x) = \frac{nx}{1+n^2x^2}, \forall x \in \mathbb{R}$, is not uniformly convergent in any interval $[a, b]$ which contains 0. 4

4. Answer any *one* question : 1×8

(a) (i) Let $D \subset \mathbb{R}$ and let $\{f_n\}$ be a sequence of functions pointwise convegent to $f(x)$. Let $M_n = \sup_{x \in D}|f_n(x) - f(x)|$. Then show that $\{f_n\}$ is uniformly convergent on D to $f(x)$ if and only if $\lim_{n\to\infty} M_n = 0$. 4

(ii) Assuming that the sum of the power series $x - \frac{x^2}{2} + \frac{x^3}{3} \ldots$ on its interval of convergence is $\log_e(1+x)$ deduce that

$$\frac{1}{1\cdot 2} - \frac{1}{2\cdot 3} + \frac{1}{3\cdot 4} - \ldots = 2\log 2 - 1$$ 4

(b) (i) Let $f : [-\pi, \pi] \to \mathbb{R}$ be continuous except for at most a finite number of jumps and is periodic of period 2π, then prove that

$$\frac{a_0^2}{2} + \sum_{k=1}^{n}(a_k^2 + b_k^2) \leq \frac{1}{\pi}\int_{-\pi}^{\pi} f^2(x)dx$$

where a_k and b_k are the Fourier co-efficients of $f(x)$ defined by

$$a_k = \frac{1}{\pi}\int_{-\pi}^{\pi} f(t)\cos nt\,dt,\ n \geq 0$$

$$b_k = \frac{1}{\pi}\int_{-\pi}^{\pi} f(t)\sin nt\,dt,\ \text{for } n \geq 1 \qquad 4$$

(ii) Define a uniform continuity of a function on an interval $[a, b]$. Show $f(x) = \frac{1}{x}, x \neq 0$ is not uniformly continuous in $(0, 1)$. 1+3

5. Answer any *one* question : 1×2

(a) Using Cauchy's principle prove that $\lim_{x\to 0} \cos\frac{1}{x}$ does not exist.

(b) Find $\overline{\lim}\, u_n$ and $\underline{\lim}\, u_n$ where $u_n = n + \frac{(-1)^n}{n}$. 2

Group—C

(Linear Algebra)

[Marks : 10]

6. Answer any *one* question : 1×8

(a) (i) A linear transformation $L : V \to W$ has an inverse if and only if it is bijective.

(Continued)

(ii) Let A, the matrix representation of the linear transformation $L : P_1(t) \to P_2(t)$ with respect to the basis $\{1, -t, t\}$ and $\{1, t, 1+t+t^2\}$ be given by

$$A = \begin{bmatrix} 2 & -1 \\ -1 & -1 \\ 1 & 1 \end{bmatrix}.$$ Determine L. 2+2+4

(b) (i) Let V and W be vector spaces over a field F and V is finite dimensional. If $T : V \to W$ be a linear mapping then show that

$$\dim \ker T + \dim \text{Im}\, T = \dim V.$$ 5

(ii) Find a linear mapping $T : \mathbb{R}^3 \to \mathbb{R}^3$ such that Ker(T) is the subspace $u = \{(x, y, z) \in \mathbb{R}^3 : x - y - z = 0\}$ of $\mathbb{R}^3$. 3

7. Answer any *one* question : 1×2

(a) A linear mapping $T : R^3 \to R^3$ is defined by $T(x, y, z) = (2x + z, x + y + z, -3x - 2z), (x, y, z) \in R^3$. Show that $T^{-1} = T$. 2+1

(Turn Over)

2019

B.Sc. (Honours)

4th Semester Examination

MATHEMATICS

Paper - C8T

(Riemann Integration and Series and functions)

Full Marks : 60 Time : 3 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answers wherever necessary.

Unit - I

(Riemann Integration)

[Marks 19]

1. Answer any ***two*** questions 2×2

(a) A function f is defined on [1, 3] by $f(x) = [x^2]$.

Evaluate $\int_1^3 f(x)\,dx$. 2

[Turn Over]

(b) If a function $f : [a, b] \to R$ be integrable on $[a, b]$ and $f(x) \geq 0$ for all $x \in [a, b]$, then prove that $\int_a^b f \geq 0$. 2

(c) If f be defined on $[-2, 2]$ by

$$f(x) = 3x^2 \cos\frac{\pi}{x^2} + 2\pi \sin\frac{\pi}{x^2}, \quad x \neq 0$$
$$= 0, \quad x = 0,$$

then show that f is integrable on $[-2, 2]$.

Evaluate $\int_{-2}^{2} f$. 1+1

2. Answer any ***one*** question : 5×1

(a) If $f : \mathbb{R} \to \mathbb{R}$ is continuous and $c > 0$, define $g : \mathbb{R} \to \mathbb{R}$ by $g(x) = \int_{x-c}^{x+c} f(t)dt$. Show that $g(x)$ is differentiable on $\mathbb{R}$ and find $g'(x)$. 4+1

(b) State Bonnet's form of second mean value theorem of integral calculus. Hence establish

$$\left| \int_a^b \sin x^2 \right| \leq \frac{1}{a} \text{ in } 0 < a < b < \infty. \quad 2+3$$

3. Answer any ***one*** question : 10×1

(a) (i) State and prove Darboux theorem. 5

(ii) If a function $f : [a, b] \to R$ be integrable on $[a, b]$ then prove that the function F defined by $F(x) = \int_a^x f(t)dt$, $x \in [a, b]$ is differentiable at any point $c \in [a, b]$ at which f is continuous and $F'(c) = f(c)$. 5

(b) (i) If a function $f : [a, b] \to R$ be integrable on $[a, b]$ then prove that $|f|$ is integrable on $[a, b]$. Is the converse true? 4+1

(ii) Define Riemann sum for a function f. A function f is defined on $[0, 1]$ by

$f(x) = 1$, if x is rational

$= 0$, if x is irrational.

[Turn Over]

Using Riemann sums, show that f is not integrable on [0, 1]. 1+4

Unit - II

[Improper Integrals]

[Marks 11]

4. Answer any ***three*** questions : 2×3

(a) Prove that $\Gamma(n+1) = n\Gamma(n), n > 0$. 2

(b) Using μ test, show that $\int_1^\infty \frac{1}{x(1+x^2)}dx$ is convergent. 2

(c) Using comparison test, show that $\int_0^1 \frac{x^{p-1}}{1+x}dx$ is convergent if $p > 0$ and is divergent if $p \leq 0$. 2

(d) State Dirichlet test for the convergence of an improper integral. 2

(e) Show that $\int_0^{\pi/2} \frac{x^m}{\sin^n x}dx$ is convergent iff $n < 1 + m$. 2

5. Answer any ***one*** question : 5×1

Examine the convergence of the integrable

(i) $\int_0^1 \frac{\log x}{\sqrt{1-x}}dx$

(ii) $\int_0^\infty x^{m-1}e^{-x}dx$

Unit - III

[Uniform convergence of sequence and series of functions]

[Marks 16]

6. Answer any ***three*** questions : 2×3

(a) If a sequence of function $\{f_n(x)\}$ be uniformly convergent on $D \subset R$, then prove that the limit function f is bounded on D. 2

(b) If $f_n(x) = x^n$, $x \in [0, 1]$, show that the sequence of functions $\{f_n\}$ is not uniformly convergent on [0, 1]. 2

[Turn Over]

(c) State Weierstrass M-test for the uniform convergence of a series of function. 2

(d) Find $\underset{x\to 0}{Lt} \sum \frac{\cos nx}{n(n+1)}$. 2

(e) If D be a finite subset of R and a sequence $\{f_n\}$ of real valued functions on D converges pointwise to f, then prove that $\{f_n\}$ converges uniformly to f on D. 2

7. Answer any ***one*** question : 10×1

(a) (i) State and prove Cauchy criterion for the uniform convergence of sequence of functions. 5

(ii) If $\{f_n\}$ be a sequence of function defined on $[0, 1]$ by $f_n(x) = nxe^{-nx^2}$, show that the sequence $\{f_n\}$ is not uniformly convergent on $[0, 1]$. 5

(b) (i) Let $D \subset R$ and for each $n \in N$, $f_n : D \to R$ is a continuous function on D. If the series $\sum f_n$ be uniformly convergent on D then prove that the sum function S is continuous on D. 4

(ii) Show that the series $\sum \frac{1}{n^3+n^4x^2}$ is uniformly convergent for all real x. If $s(x)$ be the sum function, verify that $s'(x)$ is obtained by term-by-term differentiation. 6

Unit - IV

[Fourier Series]

[Marks 7]

8. Answer any ***one*** question : 2×1

(a) Is $\sum_{1}^{\infty} \frac{\sin nx}{\sqrt{n}}$ is a Fourier Series or not? Justify.

(b) State Dirichlet's conditions for convergence of a Fourier series.

9. Answer any ***one*** question : 5×1

(a) Let $f : [-\pi, \pi] \to \mathbb{R}$ be continuous except for at most a finite number of jumps and is periodic of period 2π then prove that

[Turn Over]

$$\frac{a_0^2}{2}+\sum_{k=1}^{n}(a_k^2+b_k^2)\le\frac{1}{\pi}\int_{-\pi}^{\pi}f^2(x)\,dx$$

where a_n and b_n are the Fourier co-efficients of $f(x)$ defined by $a_k=\frac{1}{\pi}\int_{\pi}^{\pi}f(t)\cos nt\,dt$, $n\ge 0$

$$=\frac{1}{\pi}\int_{-\pi}^{+\pi}f(t)\sin nt\,dt,$$

for $n\ge 1$.

5

(b) Obtain Fourier series representation of f in $[-\pi,\pi]$ where $f(x)=x\ \forall x\in[-\pi,\pi]$ and hence deduce that $1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\ldots=\frac{\pi}{4}$.

Unit - V

[Power Series]

[Marks 7]

10. Answer any *one* question : 2×1

(a) Let $f(x)$ be the sum of a power series $\Sigma a_n x^n$ on $(-R, R)$ where $R>0$. If $f(x)+f(-x)=0$ $\forall x\in(-R,R)$. Prove that $a_n=0$ for all even positive integer.

(b) Find the interval of convergent of the power series $\sum\frac{(-1)^{n+1}}{n+1}(x+1)^n$.

11. Answer any *one* question : 5×1

(a) Let $\sum a_n x^n$ be a power series with radius of convergence $R(>0)$. Let $f(x)$ be sum of the series on $(-R, R)$ then prove that $f(x)$ is continuous on $(-R, R)$.

(b) Assume the power series

$$\frac{1}{\sqrt{1-x^2}}=1+\frac{1}{2}x^2+\frac{1.3}{2.4}x^4+\frac{1.3.5}{2.4.6}x^6+\ldots.$$

obtain the power series expansion of $\sin^{-1}x$ and hence deduce

$$1+\frac{1}{2.3}+\frac{1}{2.4.5}+\frac{1.3.5}{2.4.6.7}+\ldots=\frac{\pi}{2}$$

2019

B.Sc. (Honours)

4th Semester Examination

MATHEMATICS

Paper - C10T

Full Marks : 60 Time : 3 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answers wherever necessary.

Unit - 1 (Group A)

1. Answer any ***three*** questions : 2×3

(a) Prove that in a ring R if a is an idempotent element then $1 - a$ is also idempotent. 2

(b) Define maximal ideal in a Ring. Give it's example. 2

(c) Define char R when char R is called the trivial ring. 2

[Turn Over]

(d) If a, b be two elements of a field F and $b \neq 0$, then prove that $a = 1$ if $(ab)^2 = ab^2 + bab - b^2$. 2

(e) If R is an integral domain, then $R[x]$ is also an integral domain. Where $R[x]$ is a power series ring. 2

2. Answer any *two* questions : 5×2

(a) Define divisors of zero in a ring. Show that the ring of matrices of the form $\begin{pmatrix} a & b \\ 2b & a \end{pmatrix}$ contains no divisor of zero if $a, b \in Q$ but contains divisor of zero if $a, b \in R$. 5

(b) Show that every field is an integral domain but the converse of the theorem is not necessarly true. 5

(c) Every ideal of the ring of integers $(Z, +, .)$ is a principal ideal. 5

Unit - 2 (Group B)

3. Answer any *two* questions : 2×2

(a) Prove that the rings $(Zn, +, .)$ and $(Z/(n), +, .)$ are isomorphic. 2

(b) Let $\{R, +, .\}$ and $\{R', +, .\}$ be two rings and $f : R \to R'$ be a homomorphism. Then prove that $f(-a) = -f(a), \forall a \in R$. 2

(c) Let $R = (Z, +, .)$; $R' = (2Z, +, .)$ and $\phi : R \to R'$ be defined by $\phi(x) = 2x, \ x \in Z$, show that ϕ is not a homomorphism. 2

4. Answer any *two* questions : 5×2

(a) State and prove 1st isomorphism theorem of Ring. 5

(b) Let I and J be two ideals of a ring R. Then $I + J$ and $I \cap J$ are also ideals and the factor ring $(I + J)$ and $I/(I \cap J)$ are isomorphic. 5

(c) Let $\{R, +, .\}$ and $\{R', +, .\}$ be two rings and $f : R \to R'$ be an isomorphism, then prove that

(i) if R be commutative then R' is also Commutative

(ii) if R contains unity then R' also containing unity.

(iii) if R be without divisor of zero then R' is also without divisor of zero. 5

[Turn Over]

Unit - 3 (Group C)

5. Answer any ***two*** questions : 2×2

(a) Find the coordinate vector of the vector $(3, -3, 3)$ with respect to the basis $B = \{(1, 1, 1), (1, 1, 0), (1, 0, 0)\}$. 2

(b) Find the basis for the subspace

$$w = \left[\begin{pmatrix} x & y \\ 0 & t \end{pmatrix} : x + 2y + t = 0,\ y + t = 0 \right]$$ of the vector space of all real 2×2 matrics. 2

(c) Show that the set of real valued discontinuous functions defined on a closed interval does not form a vector space. 2

6. Answer any ***one*** question : 10×1

(a) (i) Find a basis and dimension of the subspace w in of R^3 where

$$w = \{(x, y, z) \in R^3 : x + 2y + z = 0,$$
$$2x + y + 3z = 0\}.$$

4

(ii) Show that the set of all R-valued functions defined on $[0, 1]$ having the property $f(x) = f(1 - x)$ is a vector space over R. 4

(iii) If the vectors $(0, 1, a)$, $(1, a, 1)$, $(a, 1, 0)$ of the vector space R^3 over R be linearly dependent, then find the value of a. 2

(b) (i) Suppose $\{\alpha_1, \alpha_2, \alpha_3, \alpha_4\}$ be a basis of a vector space v over a field F and a nonzero vector β of v is expressed as

$$\beta = c_1\alpha_1 + c_2\alpha_2 + c_3\alpha_3 + c_4\alpha_4 : c_i \in F$$

$(i = 1, 2, 3, 4)$ then if $c_2 \neq 0$ then prove that $\{\alpha_1, \beta, \alpha_3, \alpha_4\}$ is a new basis. 5

(ii) Let A and B be two subspaces of a finite dimensional vector space V. Then $A + B$ is also finite dimensional and

$$\dim(A + B) = \dim A + \dim B - \dim(A \cap B).$$

5

Unit - 4 (Group D)

7. Answer any ***three*** questions : 2×3

(a) Let $f : \mathbb{R}^2 \to \mathbb{R}^2$ be given by $f(x, y) = (x^2, y^2 + \sin x)$. Then find the linear transformation for the derivative of f at (x, y). 2

[Turn Over]

(b) Let $T:\mathbb{R}^3 \to \mathbb{R}^2$ be a linear transformation defined by $T(x, y, z) = (x+y, x-z)$.
Then obtain the dimension of the null space of T. 2

(c) If $\phi: v_3 \to v_1$ and $\phi(x_1, x_2, x_3) = x_1^2 + x_2^2 + x_3^2$ then show that ϕ is not a linear transformation. 2

(d) Define rank and nullity of a linear transformation. 2

(e) Obtain the matrix of the linear mapping ϕ where $\phi: R^3 \to R^2$ is defined by
$\phi(x, y, z) = (x+y+2z, 3y-2z)$. 2

8. Answer any ***one*** question : 1×10

(a) (i) Let $T: U(F) \to V(F)$ be a linear transformation and U be finite dimensional then prove that rank of (T) + nullity (T) = dim U. 5

(ii) A matrix of a linear mapping $\phi: R^3 \to R^2$ relative to the order bases (0, 1, 1), (1, 0, 1), (1, 1, 0) of R^3 and (1, 0), (1, 1) of R^2 is $\begin{pmatrix} 1 & 2 & 4 \\ 2 & 1 & 0 \end{pmatrix}$. Find ϕ. 5

(b) (i) Prove that a linear transformation $L: v \to w$ is non-singular if and only if the set $\{Lx_1, Lx_2, \ldots Lx_n\}$ is a basis of w whenever the set $\{x_1, x_2, \ldots x_n\}$ is a basis of v. 4

(ii) Show that the linear operator $V_3(R)$ defined by $T(a, b, c) = (a+b, a-b, 2c)$ is invertible. Find a formula for T^{-1}. 3

(iii) The matrix $m(T)$ of a linear mapping $T: \mathbb{R}^3 \to \mathbb{R}^2$ relative to the ordered basis ((0, 1, 1,), (1, 0, 1), (1, 1, 0)) of $\mathbb{R}^3$ and ((1, 0), (1, 1)) of $\mathbb{R}^2$ is $\begin{pmatrix} 1 & 2 & 4 \\ 2 & 1 & 0 \end{pmatrix}$.
Find T. 3

2019

Part – II

NUTRITION

(Honours)

Paper – IV

Full Marks – 90

Time : 4 Hours

he questions are of equal value for any group / half.
The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answers wherever necessary.

UNIT – 7

GROUP – A

1. Answer any **five** questions from the following : 2×5=10

   (a) Define dietary counselling.

   (b) Write any two features of fluid diet.

(c) debine febrile condition of body.

(d) What do you mean by RUTF ?

(e) Write any two symptoms of pancreatitis.

(f) Write down any two clinical condition where you can prescribe high carbohydrate diets.

(g) What are the major constituents of flatus ?

(h) What do you mean by acquired lactose intolerance ?

GROUP – B

Answer any **four** question from the following : 5×4=20

2. (a) Define parenteral feeding.

(b) Write any four conditions when parenteral feeding in adopted. 2+3

3. (a) Write the features of low energy and high energy diet.

(b) State the steps adopted for introduction of high energy diet for the management of under weight individual. 2+3

4. (a) Classify diarrhoea on the basis of causative agent.

(b) What are the major causes for ulcerative colitis ? $2\frac{1}{2}+2\frac{1}{2}$

5. (a) Write the etiology of celiac sprue.

(b) State the guidelines for dietary management of celiac sprue. 2+3

6. (a) What is the major cause of wilson's disease ?

(b) Write the dietary care of the patient suffering from Wilson's disease. 2+3

7. (a) Write the etiology of liver cirrhosis.

(b) State the dietary mangement of liver cirrhosis. 2+3

8. (a) Write any four criteria of a good dietary counseller.

(b) "Dietary counseller is a patient educator" – Justify the statement. 2+3

GROUP – C

Answer any **one** question : 15×1=15

9. (a) Write the guidelines adopted for transformation of normal diet into therapeutic diet.

(b) State the features of 'DASH' diet.

(c) Discuss in short the ways of assesment of patient's need. 5+4+6

10. (a) Classify 'Naso-enreral' feeding.

(b) What do you mean by monomeric and polymeric diet ?

(c) Define transitional feeding and state its application.

(d) Differentiate IBD from IBS. 3+3+(2+3)+4

UNIT – 8

GROUP – D

11. Answer any five questions from the following : 2×5=10

(a) Define sterilisation.

(b) What is log phase of bacterial growth cycle.

(c) Write any four features of safe drinking water.

(d) Define freeze-drying.

(e) Write the name of any two meat products.

(f) Write the name of any two liquid wastes.

(g) Give any two examples of canned foods.

(h) Write the names of any two solid media of microbial culture.

GRPUP – E

Answer any **four** questions of the following : 5×4

12. Write any five extrinsic factors influencing bacterial growth. 5

13. State difference between ford borne infection and intoxication with example. 5

14. Write the working principle of food preservation by chemical preservatives. 5

15. Describe any two method for isolation of micro-organism in brief. $2\frac{1}{2}+2\frac{1}{2}$

16. State the mechanisms of food spoilage of milk and milk products. 5

17. Describe the process of detection food borne disease out-break. 5

18. Dicuss point wise the different ways followed for maintenance of healthy state of kitchen hygiene. 5

GROUP – F

Answer any one of the following : 15×1=15

19. (a) Describe the sewage treatment system in alert.

(b) State the significance of food laws.

(c) Discuss any four sensors of sanitary quality. 7+4+4

20. (a) Discuss the role of food microbiology in food industries.

(b) Describe any two major public health hazards noted in our country due to contaminated food intake and write in brief for their management. 5+(5+5)

Two Tail (*p* values)	One Tail (*p* values)
df 9(0.05) = 2.262	df 9(0.05) = 1.833
(0.01) = 3.250	df 9(0.01) = 2.821

7+8

20. (a) State in brief about ALU.

(b) State the difference between RAM and ROM

(c) Write in brief about method of data processing.

(d) What is computer virus and site one example.

(e) Write a short note of SPSS package.

4+4+3+2+2

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NEW

Part-III 3-Tier

2019

NUTRITION

(Honours)

PAPER—VI

Full Marks : 90

Time : 4 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

UNIT—11

Group—A

1. Answer any *five* questions. 2×5

(a) What is glucose memory test ?

(b) Write the full form of GDM and MODY.

(c) State the dietary significance of second class protein.

(d) Differentiate between α and β thalassemia.

(e) What is inborn error of metabolism ?

(f) What are the common symptoms of renal failure ?

(g) Write any two major causes of anaemia.

(h) Write the fullform of IHD and CHD.

Group—B

Answer any *four* questions : 4×5

2. State the nature of carbohydrate and fat which are included in therapeutic diet of diabetic patient. Justify the adoption of high frequency meal in diabetic patient. (2+1)+2

3. Write the causes of phenyl ketonuria. State the guide lines for dietary management of phenyl ketonuria affected child. 2+3

4. Write the causes of glomerulo nephritis. Describe in brief the guideline for the therapeutic diet formulation of glomerulo nephritic patient. 2+3

5. What are the symptoms of food allergy ? Write the dietary management of food induced allergic reaction. 2+3

6. Write the causes of sickle cell anaemia. State the dietary precautions adopted in thalassemic patient. 2+3

7. Write the difference between primary and secondary hypertension. State the dietary management of hypertensive patient. 2+3

8. Classify lipoproteins with example. Why HDI is considered as good lipo protein ? 3+2

Group—C

Answer any *one* question : 1×15

9. (a) Write the different types of insulin used for treatment of diabetics.

(b) State the principle of time of meal supply of diabetic patient under treatment of insulin.

(c) Write the major sensors of lipid profile and their normal levels in plasma.

(d) Write the major causes of IDDM. 3+4+(2+2)+4

10. (a) What is nephrotic syndrome and write its causes.

(b) Write the causes of uremia.

(c) Describe the precautions considered for therapeutic diet formulation of renal patient. 4+3+8

UNIT—12

Group—D

11. Answer any *five* questions. 2×5

(a) Define data.

(b) What is sample ?

(c) What is cohort study ?

(d) Define pie-diagram.

(e) Write the core concept of 'Null hypothesis'.

(f) What is Kurtosis ?

(g) What do you mean by computer programme ?

(h) Write the name of any two common antivirus software.

Group—E

Answer any *four* questions. 4×5

12. (a) State the objectives of action research.

(b) Write the major characteristics features of good sampling. 2+3

13. (a) Describe briefly the data connection method.

(b) Write the advantages of grouped data in statistical analysis. 2+3

14. (a) Write the advantages and limitation of data presentation through 'Bar diagram'.

(b) What is skewness ? (1½+1½)+2

15. (a) Write the meaning "Test of significance".

(b) What are the conditions for the use of 'one tail and two-tail' -*t*-test ? 2+3

16. (a) Write the major domains of research in general.

(b) State the applied value of experimental research. 2+3

17. (a) Describe in short about multi-tasking operating system.

(b) Write in general about the application of computer in the field of nutrition. 2+3

18. (a) What are basic difference between hardware and software ?

(b) Write the movable and immovable storage devices in computer. 2½+2½

Group—F

Answer any *one* question. 1×15

19. (a) Compute the median value of blood sugar from the following data given in table.

Class interval (Blood sugar mg/dl)	*Frequencies*
80-85	2
86-90	3
91-95	2
96-100	8
101-105	7
106-110	4
111-115	4

(b) Find out the whether there is any significant difference or not between analysis of Laboratory *A* and *B* of following Baby food about their protein levels.

Batch No. of Baby food Sample	*Protein level (g%)*	
	Laboratory A	*Laboratory B*
1	18	16
2	14	16
3	16	17
4	18	22
5	22	19
6	20	23
7	17	18
8	16	21
9	19	22
10	23	20

2019

B.Sc. (Hons.)

4th Semester Examination

NUTRITION

Paper—C8T

Full Marks : 40 Time : 2 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

1. Answer any *five* questions of the following : 5×2=10

   (a) Why is phenylalanine not omitted form diet of phenyketonuria child ?

   (b) Write any two features of RUTF.

   (c) Write any two common symptoms of 'Irritable Bowel syndrome'.

   (d) Why does legume triggers the production of flaturs ?

   (e) Which are the metals that lead to cirrhosis through their excessdeportion in liver ?

[Turn Over]

(f) Define cholecystitis.

(g) Which are the deficiency of vitamins that results megaloblastic anaemia ?

(h) Write the names of any two test for diagncis of govt.

2. Answer any *four* questions of the following : 4×5=20

(a) Write the vicions cycle between undernutrition and diarrhoea. State the comforition ORS. 3+2

(b) Write the major dietary care for the management of patient suffering from pancreatitis.

(c) What are the causes of 'Sickle cell anemia' ? State the dietary management in brief of 'Nutritional anemia'. 2+3

(d) Write the etilosy of flatulence. Describe in short about dietary care to minimite the degree of flatulence. 2+3

(e) Define galactosemia. Write its patho-physiological reasons. State the physical symptoms of phenyl ketonuria.

(f) Write the basic difference between arthritis and govt. State the etiology of arthntis. 2+3

3. Answer any *one* of the following : 1×10=10

(a) Classify constipatioon. Write any four major causes of constipation. Describe the dretary care for the manajement of constipation.

(b) Write diagnesis of hepatatis. Why is hapatitis-B more fatal ? State the dietary management of viral hepatitis. 2+2+6

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24. সত্য সারণীর সাহায্যে বৈধতা বিচার কর : 2+2

(i) $A \supset (B \supset A)$

$A \supset B \ / \ \therefore B \supset A)$

(ii) $P \equiv (\sim PV \sim q)$

$Pv \sim P \ / \ \therefore P. \sim q$

25. অনুমান বিধি ও পরিবর্তন বিধির মধ্যে পার্থক্যগুলি কি? 4

26. একটি মুদ্রাকে পরপর তিনবার নিক্ষেপ করলে অন্ততঃ একবার হেড পড়ার সম্ভাব্যতা কত? 4

2019

Part – II

PHILOSOPHY

(Honours)

Paper – IV

(New syllabus)

Full Marks – 90

Time : 4 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

(Long Answer Type Question)

*Answer any **two** questions of the following, taking at least **one** from each group :* 15×2

GROUP – A

1. What is Existential import of Propositions? Explain the existential import of A, E, I and O propositions. 5+10

2. (a) What is Existential fallacy?

   (b) What is the rule of syllogism the violation of which leads to the existential fallacy?

Group – B

22. If A, B and C are true statements and X, Y and Z are false statements, determine the truth value of the following statements : 2+2

    (i) $[(X \supset Y) \supset \sim B] \supset \sim Z$

    (ii) $[(\sim B \supset Z) \supset \sim B] \supset \sim Z$

23. Use truth table to characterise the following statement forms of tautology, self-contradictory or contingent : 2+2

    (i) $(p \supset q) \equiv [(P \sim q) \equiv q]$

    (ii) $\sim (p \,.\, q) \supset [\sim(\sim pv \sim q) \supset p]$

24. Determine the validity of the following using truth table : 2+2

    (i) $A \supset (B \supset A)$

    $A \supset B \;/\; \therefore B \supset A)$

    (ii) $P \equiv (\sim PV \sim q)$

    $Pv \sim P \;/\; \therefore P. \sim q$

25. What are the differences between Rules of Inference and Rule of Replacement? 4

26. What is the probability of getting at least one head in the three throws of a coin? 4

(বঙ্গানুবাদ)

নিম্নের প্রতিটি বিভাগ থেকে **একটি** করে নিয়ে মোট দুটি প্রশ্নের উত্তর দাও। ১৫×২

বিভাগ – ক

১। বচনের অস্তিত্বমূলক তাৎপর্য বলতে কি বোঝ? A, E, I এবং O বচনের অস্তিত্বমূলক তাৎপর্য ব্যাখ্যা কর। 5+10

2. (a) সাত্বিকতা দোষ কি?

   (b) ন্যায়ের কোন্ নিয়মটি ভঙ্গ করলে সাত্বিকতা দোষ ঘটে?

   (c) নব্য ভাষ্য অনুসারে BRAMANTIP এবং DARAPTI কে কেন বৈধ বলা যাবে না ব্যাখ্যা কর। (ভেনচিত্রের সাহায্যে দেখাও) 4+3+8

3. (a) ন্যায় বলতে কি বোঝ?

   (b) বাস্তব উদাহরণ সহযোগে বিভিন্ন প্রকার ন্যায়ের ব্যাখ্যা দাও। 3+12

বিভাগ - খ

4. কোপীকে অনুসরণ করে মিলের অন্বয়ী-ব্যতিরেকী পদ্ধতি ব্যাখ্যা ও বিচার কর। 15

5. প্রকল্পের গ্রহণযোগ্যতার বিভিন্ন মাণদণ্ডগুলি কী কী? ব্যাখ্যা কর। 15

6. উপমাযুক্তির সংজ্ঞা দাও। উপমাযুক্তি মূল্যায়নের মাণদণ্ডগুলি উদাহরণসহ ব্যাখ্যা কর। 3+12

(নাতি-দীর্ঘ উত্তরমুখী প্রশ্নাবলী)

প্রতিটি বিভাগ থেকে অন্ততঃপক্ষে দুটি করে প্রশ্ন নিয়ে মোট পাঁচটি প্রশ্নের উত্তর লেখ : $8 \times 5 = 40$

বিভাগ - ক

7. (a) নিম্নলিখিত বাক্যগুলিকে যুক্তিবিজ্ঞান সম্মত নিরপেক্ষ বচনে পরিণত কর : 2+2

(i) সে হাসে, যখনই তাকে তার ক্ষতির কথা মনে করিয়ে দেওয়া হয়।

(ii) সে কখনও তার মতামত দেয় না যদি না তাকে জিজ্ঞাসা করা হয়।

(b) নিম্নলিখিতগুলিকে বুলীয় লিপিতে ব্যক্ত করে ভেনচিত্রে চিত্রিত কর : 2+2

(i) সবকিছুই জড়।

(ii) কেবলমাত্র S নয় P।

8. (a) নিম্নলিখিত যুক্তিগুলির বৈধতা বিচার কর ভেনচিত্রের সাহায্যে : 4+4

(i) উপস্থিত কেউ অশিক্ষিত নয়। কোন সদস্য অনুপস্থিত নয়। সুতরাং সকল সদস্য হয় শিক্ষিত।

(ii) উপস্থিত কেউ কর্মচ্যুত নয়। সকল সদস্য উপস্থিত। সুতরাং সকল সদস্যরা কর্মে নিযুক্ত।

9. (a) যদি 'কোন মানুষ নয় পূর্ণ'—সত্য হয় তাহলে নিম্নলিখিত বচনগুলির সত্যমূল্য সম্পর্কে কি অনুমান করা যায়? 2+2

(i) সকল অ-মানুষ হয় অ-পূর্ণ সত্তা।

(ii) সকল অ-পূর্ণসত্তা হয় মানুষ।

(b) পার্থক্য নির্দেশ কর :

বিপরীত বিরোধীতা এবং বিরুদ্ধ বিরোধীতা। 4

10. (a) উদাহরণসহ বৈকল্পিক ন্যায় ব্যাখ্যা কর।

(b) বুলীয় ভাষ্য অনুসারে অসম-আবর্তন (Conversion by limitation) বৈধ নয়—ব্যাখ্যা কর। 4+4

11. যুক্তি বিজ্ঞানে 'কারণ' কথাটির বিভিন্ন অর্থ ব্যাখ্যা কর। 8

বিভাগ - খ

12. নিম্নলিখিত যেকোনো চারটিকে মানক, ব্যক্তিগ্রাহক ইত্যাদি দ্বারা প্রতিকায়িত কর : 2×4

(a) যেকোনো ব্যক্তি কাপুরুষ যে পালিয়ে যায়।

(b) একটি লম্বা লোক আকর্ষণীয় হবে যদি সে কালো ও সুন্দর হয়।

(c) এই ফুলটি লাল।

(d) একজন মল্লযোদ্ধা জয়ী হয় যদি এবং কেবল যদি সে ভাগ্যবান হয়।

(e) সাধারণ ঠাণ্ডা কখনও ভয়ঙ্কর নয়।

13. আকারগত বৈধতা প্রকার কর (যেকোন দুটি) : 4+4

(a) $(Hv \sim H) \supset G \; / \; \therefore G$

(b) $(x)\,(Mx \supset Nx)$

$(\exists x)\,(Mx \,.\, Ox) \; / \; \therefore (\exists x)\,(Ox \,.\, Nx)$

(c) জোনস্ আসবে যদি সে খবর পায়, এই শর্তে যে সে যদি আগ্রহী থাকে। যদিও সে আসেনি, সে আগ্রহী ছিল। সুতরাং সে খবর পায়নি।

14. অবৈধতা প্রমাণ কর : 4+4

(a) $S \supset (T \supset U)$

$V \supset (W \supset X)$

$T \supset (V \,.\, W)$

$\sim(T \,.\, X) \; / \; \therefore S \equiv U$

(b) $(\exists x)\,(Ax \,.\, Bx)$

$(\exists x)\,(Cx \,.\, Bx) \; / \; \therefore (x)\,(Cx \supset \sim Ax)$

15. টীকা লেখ : নির্ণায়ক পরীক্ষণ। 8

16. নিম্নোক্ত যেকোনো দুটির উত্তর দাও : 4+4

(a) দুটি লুডোর খুঁটিকে দান দিলে ১০ পাবার সম্ভাবনা কত?

(b) একটি মুদ্রাকে পরপর তিনবার টস্ করলে সর্বাপেক্ষা একটি হেড ওঠার সম্ভাব্যতা কত?

(c) সুবিন্যস্ত এক প্যাকেট তাস থেকে পরপর তিনটি তাস টানলে একটি তাসের রুহিতন হওয়ার সম্ভাব্যতা কত?

(i) যদি টানার পর প্রতিটি তাস পুনরায় প্যাকেটে রেখে দেওয়া হয়।

(ii) যদি টানার পর তাসগুলি আর প্যাকেটে না রাখা হয়।

(সংক্ষিপ্ত উত্তরমুখী প্রশ্নাবলী)

প্রতিটি বিভাগ থেকে অন্ততঃপক্ষে দুটি করে প্রশ্ন নিয়ে মোট পাঁচটি প্রশ্নের উত্তর লেখ : $4 \times 5 = 20$

বিভাগ - ক

17. কপিকে অনুসরণ করে যুক্তি বিজ্ঞানের সংজ্ঞা দাও। 4

18. একব্যক্তিবাচক বচন কাকে বলে? উদাহরণ দাও। 4

19. বস্তুগত প্রতিপত্তি কি? 4

20. আকারগত বৈধতা বলতে কি বোঝ? 4

21. দ্বিকল্প ন্যায় (Dilemma) কি? উদাহরণ দাও। 4

বিভাগ - খ

22. যদি A, B ও C সত্য এবং X, Y ও Z মিথ্যা হয় তাহলে নিম্নোক্ত বাক্যগুলির সত্যমূল্য নির্ণয় কর : 2+2

(i) $[(X \supset Y) \supset \sim B] \supset \sim Z$

(ii) $[(\sim B \supset Z) \supset \sim B] \supset \sim Z$

23. সত্য সারণীয় সাহায্যে নিম্নোক্তগুলির কোনটি স্বতঃসত্য, স্বতোমিথ্যা বা আপতিক নির্ধারণ কর : 2+2

(i) $(p \supset q) \equiv [(P \sim q) \equiv q]$

(ii) $\sim (p \,.\, q) \supset [\sim(\sim pv \sim q) \supset p]$

2019

Part – II

PHILOSOPHY

(Honours)

Paper – III

(New syllabus)

Full Marks – 90

Time : 4 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

(Long Answer Type Question)

*Answer any **two** questions taking at least **one** from each group :* 15×2

GROUP – A

1. What is meant by organization of sense field ? Explain critically in this context the Gestalt theory of perception. 3 +12
2. What is introspection ? Explain critically the demerits of this method. Can it be regarded as a

GROUP – A

17. Write a short note on the function of cerebellum. 4

18. Can we improve memory by practice – Discuss. 4

19. State the attributes of sensation. 4

20. What are the evidence in support of the existence of unconscious level ? 4

21. State the theory of interactionism between body and mind. 4

GROUP – B

22. Explain the relation beetween Social Philosphy and Political Philosophy. 4

23. Distinguish between an association and an Institution. 4

24. What is 'Freedom' according to Rabindranath Tagore ? 4

25. Explain the implication of 'non-violence' after Gandhi. 4

26. Explain the idea of Liberal Democracy. 4

(বঙ্গানুবাদ)

নিম্নের প্রতিটি বিভাগ থেকে একটি করে নিয়ে মোট দুটি প্রশ্নের উত্তর দাও। ১৫×২

বিভাগ – ক

১। সংবেদনীয় ক্ষেত্রের সংগঠন বলতে কী বোঝায় ? এই বিষয়টির পরিপ্রেক্ষিতে গেস্টাল্টবাদীদের প্রত্যক্ষ সংক্রান্ত মতবাদ সবিচার আলোচনা কর। ৩+১২

২। অন্তর্দর্শন কাকে বলে ? এই পদ্ধতির দোষগুলি বিচারসহ আলোচনা কর। মনোবিদ্যায় এই পদ্ধতি কি নির্ভরযোগ্য পদ্ধতিরূপে গ্রহণীয় হতে পারে ? উত্তরের স্বপক্ষে যুক্তি দাও। ৪+৬+৫

৩। চেতনার বিভিন্ন স্তরগুলি কি কি ? চেতনার বৈশিষ্ট্যগুলি আলোচনা কর। মন ও চেতনা কি সমব্যাপক ? ৩+১০+২

বিভাগ – খ

৪। গণতন্ত্রের মূল নীতিগুলি উল্লেখ কর। গণতন্ত্রের দোষগুণগুলির ব্যাখ্যা কর। গণতন্ত্রের ত্রুটিগুলি কিভাবে দূর করা সম্ভব ? ৪+৮+৩

৫। সমাজ ও ব্যক্তির সম্বন্ধ বিষয়ে ব্যক্তিস্বাতন্ত্র্যবাদ আলোচনা কর। এই মতবাদ সন্তোষজনক কিনা সংক্ষেপে ব্যাখ্যা কর। ১০+৫

৬। গান্ধীজির দর্শনের তিনটি মূল সূত্র কি কি ? 'অছিতন্ত্র' কি ? গান্ধীজিকে অনুসরণ করে অছিতন্ত্র ব্যবস্থার তাৎপর্য ব্যাখ্যা ও বিচার কর। ৩+২+১০

(নাতি–দীর্ঘ উত্তরমুখী প্রশ্নাবলী)

নিম্নের প্রতিটি বিভাগ থেকে অন্ততঃ দুটি করে নিয়ে মোট পাঁচটি প্রশ্নের উত্তর দাও । ৮×৫

বিভাগ — ক

৭। থর্নডাইকের শিক্ষণ সম্পর্কীয় সূত্রগুলি কি কি ? এইসব সূত্রগুলি কি প্রাণীর শিক্ষণকে ব্যাখ্যা করার পক্ষে যথেষ্ট ? — আলোচনা কর । ৪+৪

৮। স্মৃতির উপাদানগুলি ব্যাখ্যা কর । বিস্মৃতি কি একটি অভিশাপ ? তোমার উত্তরের স্বপক্ষে যুক্তি দেখাও । ৪+৪

৯। স্পিনোজার দ্বিপার্শ্বিক মতবাদ ব্যাখ্যা ও বিচার কর । এই মতবাদ অন্যান্য মতবাদের তুলনায় কি উন্নত মানের ? যুক্তি দাও । ৪+৪

১০। কালিক বয়স ও মানসিক বয়সের মধ্যে পার্থক্য দেখাও । বুদ্ধাঙ্ক কিভাবে নির্ধারণ করা হয় ? ৪+৪

১১। সংক্ষেপে ফ্রয়েডের মনঃসমীক্ষণ ব্যাখ্যা কর । ৮

বিভাগ — খ

১২। 'মুখ্য গোষ্ঠী বলতে কি বোঝ ? 'সমাজের মধ্যে পরিবারই হচ্ছে সর্বাপেক্ষা বেশী গুরুত্বপূর্ণ মুখ্যগোষ্ঠী' — আলোচনা কর । ২+৬

১৩। রাষ্ট্র ও জাতির সম্পর্ক নির্ণয় কর । ৮

১৪। 'ইউটোপিয়ান সমাজতন্ত্র' বলতে কি বোঝায় ? বৈজ্ঞানিক সমাজতন্ত্র এবং ইউটোপিয়ান সমাজতন্ত্রের মধ্যে পার্থক্য নির্দেশ কর । ৪+৪

১৫। সার্ত্রের দর্শন অনুসারে স্বাধীনতার ধারাটি ব্যাখ্যা কর । ৮

১৬। প্রগতিশীল নারীবাদের মূল বৈশিষ্ট্যগুলি আলোচনা কর । ৮

(সংক্ষিপ্ত উত্তরমুখী প্রশ্নাবলী)

নিম্নের প্রতিটি বিভাগ থেকে অন্ততঃপক্ষে দুটি করে নিয়ে মোট পাঁচটি প্রশ্নের উত্তর দাও । ৪×৫

বিভাগ — ক

১৭। লঘু মস্তিষ্কের কার্যাবলীর ওপর সংক্ষিপ্ত টীকা লেখ । ৪

১৮। অনুশীলনের সহায়তায় আমরা স্মৃতিশক্তির উন্নতি করতে পারি কি ? ৪

১৯। সংবেদনের ধর্মগুলি উল্লেখ কর । ৪

২০। নির্জ্ঞান মনের স্তর স্বীকারের সপক্ষে যুক্তিগুলি কি কি? ৪

২১। দেহ ও মনের সম্পর্ক বিষয়ে ক্রিয়া–প্রতিক্রিয়াবাদ বর্ণনা কর । ৪

বিভাগ — খ

২২। সমাজদর্শন ও রাষ্ট্রদর্শনের মধ্যে সম্বন্ধ ব্যাখ্যা কর । ৪

২৩। সংঘ ও প্রতিষ্ঠানের মধ্যে পার্থক্য কর । ৪

২৪। রবীন্দ্রনাথ ঠাকুরের মতে 'স্বাধীনতা' কী ? ৪

২৫। গান্ধীজির অনুসরণে 'অহিংসার' তাৎপর্য ব্যাখ্যা কর । ৪

২৬। উদারনৈতিক গণতন্ত্রের ধারণাটি ব্যাখ্যা কর । ৪

17. (a) Calculate the angle between [111] and $[\bar{1}\bar{1}1]$ directions in a cubic crystal.

(b) Consider a set of lattice planes having inerseparation 1.95 Å. If we use X-rays of wavelength λ = 1.542Å, find all possible Bragg angles for reflection from those planes. 2+2

18. (a) An oscillator consists of a weight of 1 kg at the end of a light rod of length 1 m. If the amplitude of oscillation is 0.1 m. Calculate the approximate value of the quantum number. 2

(b) Show that the eigen functions corresponding to distinct eigen values of Hamiltonian are orthogonal. 2

19. Silver (fcc) has an atomic radius of 1.4Å. Assuming silver to be monovalent metal, compute the values of Fermi energy, Fermi temperature and the Fermi velocity.

Given $\hbar = 1.05\times10^{-34}$ J-s ; $m_{el} = 9.1\times10^{-31}$ kg

$k_B = 1.38\times10^{-23}$ J K^{-1} 4

20. (a) What is Meissner effect ?

(b) A superconducting material has a critical temperature 4k in zero magnetic field, and at 0K, the critical field is 0.03 Tesla. Find the critical field at 3K. 2+2

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NEW

Part–III 3-Tier

2019

PHYSICS

(Honours)

PAPER—VI

Full Marks : 90

Time : 4 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group—A

Answer any *two* questions.

1. (a) For a decimal harmonic oscillation with mass m and angular frequency w, define

$$\hat{a}_{\pm} = \sqrt{\frac{mw}{2\hbar}}\left(\hat{x} \pm i\frac{\hat{p}_x}{mw}\right),$$

where the other terms and symbols are of usual meaning. Show $\hat{a}_+ \hat{a}_-$ that represent number operations, such that $\hat{N}\varphi_n = n\varphi_n$ when $\hat{N} = \hat{a}_+ \hat{a}_-$ and n is the eigen value in the number state specified by

ψ_n. Based on the defined operators, find the expectation values of kinetic and potential energy in the ground state of the harmonic oscillator. 6

(b) For the mentioned oscillator, show that the probability of finding the particle within classical turning points is greater than 0.8. 4

(c) Show that $\frac{d}{dt}\langle \hat{p}_x \rangle = -\left\langle \frac{\partial V}{\partial x} \right\rangle$, $\hat{p}_x$ and V denote the momentum operator for x-directional motion and position dependent potential. 3

(d) Show that, for two Hermitian operators $\hat{A}$ and $\hat{B}$, $(\hat{A}\hat{B})^+ = \hat{B}^+\hat{A}^+$. 2

2. (a) What do you mean by Q-value of a nuclear reaction ? For a nuclear reaction $X(x, y)Y$ show that,

$$Q = T_y\left(1+\frac{m_y}{M_Y}\right) - T_x\left(1-\frac{m_x}{M_X}\right) - \frac{2}{M_Y}\sqrt{m_x m_y T_x T_y}\cos\theta$$

where θ is the scattering angle. 6

(b) Show that the threshold energy for an endoergic reaction is give by

$$E_{th} = -\frac{(m_y + M_Y)Q}{M_X - Q} = -Q\left(1-\frac{m_x}{M_X}\right)$$

for $Q << m_x$ 4

(c) How does the cross-section for the neutron and proton induced nuclear reactions vary with energy ? Explain. 5

3. (a) Draw the trajectory of a Plank oscillator in a two dimensional phase space. Determine the number of cells in the mentioned phase space for the given oscillator having energy between 0 and ε. Given that the mass of the oscillator is m and its frequency is ν. 1½+2½

(b) What is Gibbs paradox ? Following this paradox, determine the entropy for mixing of two gases considering appropriate partition function for the system. What does the final expression of the entropy imply physically ? 2+4+2

(c) Two classical particles have energy states $E = 0, \varepsilon, 2\varepsilon$ with degeneracies 1, 2, 4 respectively. Find the average energy of the system. 3

4. (a) If $[hkl]$ be the Miller indices of a lattice plane with axial units a, b and c, this show that the separation between two successive planes is given by

$$d = \frac{1}{\sqrt{\frac{h^2}{a^2}+\frac{k^2}{b^2}+\frac{l^2}{c^2}}}$$ 3

(b) Find the packing fraction of F.C.C structure. 3

(c) Explain paramagnetic Curie-temperature interms of Curie-weiss law. Write down the basic assumptions needed for quantum theory of paramagnetism. What is the significance of effective number of Bohr-magneton ? 2+2+2

(d) Determine the expression of the Clausius-Mossotti Relation in respect of local field effect in the polarization in di-electric material. 3

Group—B

Answer any *five* questions.

5. (a) Consider the potential barrier of the form

$$v(x) = v_0 ; \quad |x| < \frac{a}{2}$$

$$= 0 ; \quad |x| > \frac{a}{2}$$

In the region $|x| < \frac{a}{2}$, the wave function is given by $\varphi(x) = Ae^{-\alpha x}$ with A and α as constants. Calculate $\langle x \rangle$, $\langle x^2 \rangle$ and show that $\Delta x \sim \frac{1}{\alpha}$. 5

(b) Find the average distance of 1S electron from the nucleus if the wavefunction for 1S orbit of hydrogen atom is

$$\psi_{1,0,0} = \frac{1}{\sqrt{\pi a_0^3}} e^{-r/a_0}$$

where a_0 is Bohr radius. 3

6. (a) Give a short note on Bohr's postulate of compound nucleus. 5

(b) What is Ghoshal's experiment ? 3

7. (a) What do you mean by 'dead time' in GM counter ? A GM counter has a deadtime of 400 μs. What are the true counting rates when the observed rates are 10 per minute ? 2+2

(b) Discuss the origin of Cosmic rays. 4

8. (a) The result of Kronig Penny model is given by

$$p\frac{\sin \alpha a}{\alpha a} + \cos \alpha a = \cos ka$$

where $p = \frac{mV_0 ab}{\hbar}$ and $\alpha^2 = \frac{2mE}{\hbar^2}$, other symbols have their usual meanings. Plot the curve of the left hand side as a function of αa and draw the conclusions. 3

(b) Prove that the number of possible states in an energy band of a finite crystal is equal to the number of primitive cells in it. 2

(c) Prove that effective mass can be expressed as $m^* = \frac{\hbar^2}{d^2E/dk^2}$. What is meant by negative effective mass. 2+1

9. (a) What do you mean by Bose-Einstein condensation ? How does it differ from a vapour condensing into the liquid state ? 3

(b) Establish a condition on the number of particles of a system at temperature T at which Bose condensation occurs. Also identify the Bose temperature. 5

10. (a) Consider N-particle ideal gas system in a volume V. Derive the expression of translational partition function. Hence, find the form of translational partition function of a diatomic molecule. 3½+1½

(b) For a system of non-interacting phonons, find expression of average energy.

[Given that $\int_0^\infty \frac{x^3}{e^x-1}dx = \frac{\pi^4}{15}$] 3

11. (a) Give an account of the essential characteristics of nuclear fission. How does the phenomenon find application in a nuclear reactor ? 2+2

(b) What are 'prompt' and 'delayed' neutrons ? Explain the role of delayed neutrons in nuclear reactor. 1+1+2

12. Write down the postulates of Debye's theory of specific heat of metal. Draw the plots of density of frequency modes per unit frequency range in case of Debye-model and Einstein's model. At low temperature write down the expression of total energy. What is Debye-temperature ? Briefly state about the shortcomings of Debye-model.
2+(1½+1½)+1+1+1

Group—C

Answer any *five* questions.

13. The raising ($\hat{L}_+$) and ($\hat{L}_-$) lowering operators for orbital angular momentum states change the value of m by one unit ; where $m\hbar$ is the eigen value of the operator $\hat{L}_z$

Then show that,

(i) $\hat{L}_-\hat{L}_+ = \hat{L}^2 - \hat{L}_z^2 - \hbar\hat{L}_z$

(ii) $\hat{L}_+ f_l^m = \hbar\sqrt{l(l+1)-m(m+1)}\, f_l^{m+1}$

where f_l^m is the normalised simultaneous eigen states for the operators $\hat{L}_z$ and $\hat{L}^2$. 4

14. Write down Pauli spin-matrices. The spin state of an electron is an eigenstate of $\frac{\hbar}{2\sqrt{2}}(\sigma_x+\sigma_y)$. What is the probability that the z-component of spin of the electron will be $\frac{1}{2}\hbar$? 1+3

15. A spin $\frac{1}{2}$ particle of mass m with charge $-e$ in an external magnetic field B.

(i) What is the Hamiltonian of the system ?

(ii) If S is the spin angular momentum vector, show that $\frac{d\vec{S}}{dt} = -\frac{e}{m}(\vec{S}\times\vec{B})$ quantum mechanically. 1+3

16. Which of the following reactions are allowed or forbidden and why ?

(i) $n \to p + e^-$ (ii) $n \to \pi^+ + e^- + \bar{\nu}_e$

(iii) $\pi^- + p \to \pi^0 + n$ (iv) $\pi^+ \to \mu^+ + \nu_\mu$ 4

(ii) Show that —

$$\int_0^{2\pi} \frac{d\theta}{5+3\sin\theta} = \frac{\pi}{2}$$ 4

(b) (i) Find the characteristic equation of the symmetric matrix

$$A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$$

Apply Cayley-Hamilton theorem to obtain A^{-1}. 5

(ii) State and prove convolution theorem of Fourier transform. 5

2019

B.Sc. (Hons)

4th Semester Examination

PHYSICS

Paper - C8T

Full Marks : 40 Time : 2 Hours

The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable.

1. Answer any *five* questions : 5×2=10

(a) What is the Fourier transform of $\delta(x-a)$, where a is a constant ? 2

(b) Evaluate $\oint_c \frac{dz}{z}$ where c denotes a simple closed curve that encloses the origin. 2

(c) If F(k) be the Fourier transform of f(x), then show that

$$F[f(x)\cos ax] = \frac{1}{2}[F(k+a)+F(k-a)]$$

[Turn Over]

(d) If λ be an eigen value of matrix A(non-zero matrix), show that λ^{-1} is an eigen value of A^{-1}.

(e) Prove that $F_s\left[e^{-ax}\right]=\sqrt{\frac{2}{\pi}}\left(\frac{s}{a^2+s^2}\right)$

(f) Expand $f(z)=\cosh z$ about πi.

(g) What is meant by similarity transformation ?

(h) Find the poles and residues of the function

$$f(z)=\frac{3-2z}{(z-2)(z-1)^2}$$

2. Answer any *four* questions : 4×5=20

(a) Consider $f(x)=\frac{1}{2L}$ for $|x|<L$

$=0$ for $|x|>L$

Calculate the Fourier transform of f(x) and state its limiting value as $L\to 0$. 4+1

(b) Show that $|\sin(z)|\geq|\sin(x)|$, where $z=x+iy$. 5

(c) If $\lambda_1,\lambda_2,\ldots.\lambda_n$ are the eigen values of a matrix A, find the eigen values of the matrix $(A-\lambda I)^2$. Here I is the unit matrix. 5

(d) Evaluate $\int_0^{2\pi}\frac{\cos 2\theta}{5+4\cos\theta}d\theta$ by using contour integration.

(e) Find a matrix P which diagonalizes the matrix $A=\begin{bmatrix}4 & 1\\ 2 & 3\end{bmatrix}$, verify $P^{-1}AP=D$ where D is the diagonal matrix.

(f) Obtain the Cauchy-Riemann equations in connection with analyticity of a function of complex variables.

3. Answer any *one* question : 10×1=10

(a) (i) Solve the equation $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ using Fourier transform under the condition

$u = 0$ at $x = 0$

$$u=\begin{cases}1, & 0<x<1\\ 0 & x\geq 1\end{cases} \quad \text{when } t=0$$

and u is bounded 6

[Turn Over]

(ii) Show that —

$$\int_0^{2\pi} \frac{d\theta}{5+3\sin\theta} = \frac{\pi}{2}$$ 4

(b) (i) Find the characteristic equation of the symmetric matrix

$$A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$$

Apply Cayley-Hamilton theorem to obtain A^{-1}. 5

(ii) State and prove convolution theorem of Fourier transform. 5

2019

B.Sc. (Hons)

4th Semester Examination

PHYSICS

Paper - C8T

Full Marks : 40 Time : 2 Hours

The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable.

1. Answer any *five* questions : 5×2=10

(a) What is the Fourier transform of $\delta(x-a)$, where a is a constant ? 2

(b) Evaluate $\oint_c \frac{dz}{z}$ where c denotes a simple closed curve that encloses the origin. 2

(c) If F(k) be the Fourier transform of f(x), then show that

$$F[f(x)\cos ax] = \frac{1}{2}[F(k+a)+F(k-a)]$$

[Turn Over]

2019

Part – II

POLITICAL SCIENCE

(Honours)

Paper – III

Full Marks – 90

Time : 4 Hours

The questions are of equal value for any group / half.

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

GROUP – A

Answer **any two** of the following questions: 15×2

1. Analyse the behavioural approach to the study of politics.

2. Define political power. Analyse the classification of authority according to Max Weber.

21. Give the classification of Rights.

22. What are the factors contributing to the feeeling of nationalism.

23. Difference between political power and political authoriy.

24. Protective theory of democracy.

25. Different stages of social evolution, according to Marx.

26. What is Dictatorship of Proletariat ?

(Bengali Version)

বিভাগ — ক

যে কোনো দুটি প্রশ্নের উত্তর দাও : ১৫×২

১। রাজনীতি অধ্যয়নে আচরণবাদী দৃষ্টিভঙ্গী বিশ্লেষণ কর ।

২। রাজনৈতিক ক্ষমতার সংজ্ঞা দাও । ম্যাক্স ওয়েবার বর্ণিত কর্তৃত্বের শ্রেণীবিভাজন সম্পর্কে লেখ ।

৩। রাষ্ট্র সম্পর্কিত ব্যক্তিস্বাতন্ত্র্যবাদী তত্ত্ব সম্পর্কে লেখ ।

৪। স্বাধীনতার সংজ্ঞা দাও । স্বাধীনতা ও সাম্যের পারস্পরিক সম্পর্ক আলোচনা কর ।

৫। রাজনীতি সম্পর্কিত মার্ক্সীয় দৃষ্টিভঙ্গী আলোচনা কর ।

৬। 'এক দেশে সমাজতন্ত্র' সম্পর্কে স্তালিন–ট্রটস্কির বিতর্ক আলোচনা কর ।

বিভাগ — খ

যে কোনো পাঁচটি প্রশ্নের উত্তর দাও : ৪×৫

৭। রাষ্ট্র সম্পর্কে আদর্শবাদী তত্ত্ব ব্যাখ্যা কর ।

৮। অধিজাতীয়তাবাদ কারকগুলি কিভাবে রাষ্ট্রীয় সার্বভৌমিকতাকে আঘাত করছে ?

৯। অধিকার ও কর্তব্যের পারস্পরিক সম্পর্ক বিষয়ে লেখ ।

১০। আইনের উৎস সম্পর্কে লেখ ।

১১। অংশগ্রহণমূলক গণতন্ত্র সম্পর্কে আলোচনা কর ।

১২। অ্যালমণ্ড ও পাওয়েল বর্ণিত কাঠামো–কার্যাবলী দৃষ্টিভঙ্গী ব্যাখ্যা কর ।

১৩। মার্কসের অনুসারে ভিত্তি ও উপরিকাঠামোর পারস্পরিক সম্পর্ক ব্যাখ্যা কর ।

১৪। পুঁজিবাদের উদ্ভবে পেছনে কারণ কি ছিল মার্কসের মতানুসারে ?

১৫। রাষ্ট্র সম্পর্কের মার্কসীয় ধারণা আলোচনা কর ।

১৬। বিপ্লব সম্পর্কিত মার্কসীয় তত্ত্বের বিকাশে লেনিনের অবদান আলোচনা কর।

বিভাগ – গ

যে কোনো পাঁচটি প্রশ্নের উত্তর দাও ঃ **৪×৫**

১৭। রাজনীতি সম্পর্কিত সনাতনী দৃষ্টিভঙ্গির দুটি বৈশিষ্ট্য লেখ ।

১৮। নব্য ব্যক্তিস্বাতন্ত্র্যবাদী তত্ত্ব বলতে কি বোঝায় ?

১৯। সার্বভৌমিকতা সম্পর্কিত অস্টিনের দৃষ্টিভঙ্গি ।

২০। স্বাধীনতা সম্পর্কিত নেতিবাচক ও ইতিবাচক ধারণা ।

২১। অধিকারের শ্রেণীবিন্যাল কর ।

২২। জাতীয়তাবোধকে উন্মোচিত করে এমন উপাদানগুলি লেখ ।

২৩। রাজনৈতিক ক্ষমতা ও রাজনৈতিক কর্তৃত্বের পার্থক্য

২৪। গণতন্ত্র সর্ম্পকে সুরক্ষামূলক তত্ত্ব ।

২৫। মার্কসের অনুসরণে সমাজবিকাশের বিভিন্ন স্তরসমূহ ।

২৬। প্রলেডারিয়েত অধিনায়কত্ব বলতে কি বোঝায় ?

2019

Part – II

POLITICAL SCIENCE

(Honours)

Paper – IV

(New Syllubus)

Full Marks – 90

Time : 4 Hours

The questions are of equal value for any group / half.

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

GROUP – A

Answer **any two** of the following questions : 15×2

1. Define Comparative Government. Distinguish between comparative Government and Comparative Politics.
2. Examine the nature of federalism in USA and Switzerland.

3. Attempt a comparative study of the party systems in UK and PRC.

4. Compare the role of the Second chamber of the legislature in UK and USA.

5. Analyse the role of the Speaker in a parliamentary and a presidential system.

6. Write an essay on the Rights and Duties of the citizens in PRC.

GROUP – B

Answer **any five** of the following questions : 8×5

7. Identify the distinguishing features of the liberal political systems in UK and USA.

8. Point out the significance of judicial review in USA.

9. Mention, in brief, the General Principles of the 1982 Constitution of PRS.

10. Indicate the basic features of the unitary system in UK.

11. Discuss, in brief, the role of interest groups in USA.

12. Make a comparative study of the committee system in UK and USA.

13. Why is Switzerland called a mixed form of Governmental system ? Argue your case.

14. Discuss the structure of the Executive in PRC.

15. Attempt a comparison of the relationship between the Executive and legislature in UK and USA.

16. Write a short note on the role of Procuratorate in PRC.

GROUP – C

Answer **any five** of the following questions : 4×5

17. Point out the significance of studying comparative politics.

18. What is meant by Parliamentary Sovereignty ?

19. What are 'Referendum' and 'Initiative' ?

20. How is the "Central Military Commission" in PRC constituted ?

21. What is a 'money bill' ?

22. How is the President in USA elected ?

23. What is meant by 'cabinet dictatorship ?

24. Discuss the composition of the Swiss Federal Council.

25. Mention any two features of a socialist political system.

26. What is meant by 'Rule of Law' in the political system of UK?

(Bengali Version)

দক্ষিণ প্রান্তস্থ সংখ্যাগুলি প্রশ্নমান নির্দেশক ।

(নূতন পাঠক্রম)

বিভাগ — ক

যে কোনো দুটি প্রশ্নের উত্তর দাও ঃ ১৫×২

১। তুলনামূলক শাসনব্যবস্থা-র সংজ্ঞা দাও । তুলনামূলক শাসনব্যবস্থা ও তুলনামূলক রাজনীতি-র পার্থক্য নিরূপণ কর ।

২। মার্কিন যুক্তরাষ্ট্র ও সুইজারল্যাণ্ড-এ যুক্তরাষ্ট্রীয় ব্যবস্থার প্রকৃতি বিচার কর ।

৩। গ্রেট বৃটেন ও গণপ্রজাতন্ত্রী চীন-এ দলীয় ব্যবস্থার একটি তুলনামূলক আলোচনা কর ।

৪। গ্রেট বৃটেন ও মার্কিন যুক্তরাষ্ট্রে আইনসভার দ্বিতীয় কক্ষের ভূমিকা-র তুলনা কর ।

৫। সংসদীয় ও রাষ্ট্রপতি শাসিত ব্যবস্থায় স্পীকার-এর ভূমিকা বিশ্লেষণ কর ।

৬। গণপ্রজাতন্ত্রী চীন-এ নাগরিকদের অধিকার ও কর্তব্য-র ওপর একটি নিবন্ধ লেখ ।

2019

Part – II

POLITICAL SCIENCE

(Honours)

Paper – V

Full Marks – 90

Time : 4 Hours

The question are of equal value for any group / half.
The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answer wherever necessary.

GROUP – A

Answer any **two** of the following questions : 15×2

1. Give a brief outline of the different phases of the evolution of International Relations as an academic discipline
2. Comment on the evolution of state system as unit of interrational relation.

3. Analyse the basic postulates of Realism as developed by Hons J. Morganthau.

4. Trace the evolution of India's foreign policy since 2010.

5. Write a note on different proposals for reform of the UN charter.

6. Discuss how environmental issues have become a major component of International Relations at contemporary times.

GROUP – B

Answer any **five** of the following questions : 8×5

7. Discuss the key features of neo-colonialism.

8. Write a note on the 1992 'Earth Summit'.

9. Discuss the political dimensions of globalisation.

10. Explain the difference between secret and open diplomacy.

11. Identity the causes of the failure of SAARC as a regional organisation.

12. Discuss the role of transnational actors in contemporary world.

13. Discuss the powers and functions of the International Court of Justice.

14. Analyse Russia's foreign policy towards the west in recent year.

15. Write a note on the relevance of ECOSOC in the present day world.

16. Explain China's foreign policy towards Pakistan in recent years.

GROUP – C

Answer any **five** of the following questions : 4×5

17. Identity the basic features of the world system as outlined by Wallerstein.

18. Mention the objectives of ASEAN.

19. What is regionalism ?

20. Define Terrorism.

21. Briefly explain 'No first use' policy of India.

22. What do you mean by 'crisis of nation state' ?

23. Discuss the objectives of United Nations.

24. Distinguish between disarmament and arms control.

25. Explain the concept of 'Double Veto'.

26. Mention any four principles of the UN as laid down by Article 2 to the UN charter.

(Bengali Version)

বিভাগ – ক

যে কোনো দুটি প্রশ্নের উত্তর দাও ঃ ১৫×২

১। পাঠ্যবিষয় হিসাবে আন্তর্জাতিক সম্পর্কের বিবর্তনের বিভিন্ন পর্যায়ের সংক্ষিপ্ত পরিচয় দাও ।

২। আন্তর্জাতিক সম্পর্কের একক হিসাবে রাষ্ট্র ব্যবস্থার বিবর্তন–এর ওপর মন্তব্য কর ।

৩। এইচ.যে.মর্গেনথাউ–এর বাস্তববাদী মূল নীতিগুলি বিশ্লেষণ কর।

৪। ২০১০ সাল থেকে ভারতের পররাষ্ট্র নীতির বিবর্তন অনুসন্ধান কর ।

৫। সম্মিলিত জাতিপুঞ্জের সনদ সংস্কারের বিভিন্ন প্রস্তাব সম্পর্কে টীকা লেখ ।

৬। সমসাময়িক সময়ে আন্তর্জাতিক সম্পর্কের ক্ষেত্রে পরিবেশ সংক্রান্ত বিষয়গুলি কিভাবে একটি গুরুত্বপূর্ণ উপাদান হয়ে দাড়িয়েছে আলোচনা কর ।

বিভাগ – খ

যে কোনে পাঁচটি প্রশ্নের উত্তর দাও ঃ ৮×৫

৭। নয়া–উপনিবেশবাদের মূল বৈশিষ্ট্যগুলি আলোচনা কর ।

৮। ১৯৯২–এ অনুষ্ঠিত 'বসুন্ধরা সম্মেলন'এর ওপর একটি টীকা লেখ ।

৯। বিশ্বায়নের রাজনৈতিক দিকগুলি আলোচনা কর ।

১০। গোপন ও মুক্ত কূটনীতির মধ্যে পার্থক্য ব্যাখ্যা কর ।

১১। আঞ্চলিক সংগঠন হিসাবে SAARC–এর ব্যর্থতার কারণগুলি নির্দ্দিষ্ট কর ।

১২। বর্তমান বিশ্বে আতিজাতিক কারকগুলির ভূমিকা আলোচনা কর ।

১৩। আর্ন্তজাতিক বিচারালয়–এর ক্ষমতা ও কার্যাবলী আলোচনা কর।

১৪। সাম্প্রতিক কালে পশ্চিমের প্রতি রাশিয়ার বিদেশ নীতি বিশ্লেষণ কর ।

১৫। বর্তমান বিশ্বে অর্থনৈতিক ও সামাজিক পরিষদের (ECOSOC) প্রাসঙ্গিকতা সম্পর্কে একটি সংক্ষিপ্ত টীকা লেখ ।

১৬। সাম্প্রতিক বৎসরগুলিতে পাকিস্তানের প্রতি চীনের বিদেশনীতি ব্যাখ্যা কর ।

বিভাগ – গ

যে কোনো পাঁচটি প্রশ্নের উত্তর দাও ঃ ৪×৫

১৭। ওয়ালারস্টাইনের বক্তব্য অনুসারে বিশ্বব্যবস্থার মূল বৈশিষ্ট্যগুলি চিহ্নিত কর ।

১৮। ASEAN - এর উদ্দেশ্যগুলি উল্লেখ কর ।

১৯। আঞ্চলিকতাবাদ কাকে বলে ?

২০। সন্ত্রাসবাদের সংজ্ঞা দাও ।

২১। ভারতের 'প্রথম ব্যবহার নয়' (No first use) নীতিটি সংক্ষেপে ব্যাখ্যা কর ।

২২। 'জাতিরাষ্ট্রের সংকট বলতে কী বোঝ ?

২৩। সম্মিলিত জাতিপুঞ্জের উদ্দেশ্যগুলি আলোচনা কর ।

২৪। নিরস্ত্রীকরণ ও অস্ত্র–নিয়ন্ত্রণের মধ্যে পার্থক্য কর ।

২৫। 'দ্বৈত–ভেটো'–এর ধারণাটি ব্যাখ্য কর ।

২৬। সম্মিলিত জাতিপুঞ্জের সনদের ২ নং ধারায় উল্লিখিত যে কোন চারটি নীতি উল্লেখ কর ।

NEW

Part–III 3-Tier

2019

STATISTICS

(Honours)

PAPER—VIIA

Full Marks : 50

Time : 4 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group—A

(Analysis of Variance & Covariance and Design of Experiments)

1. Answer any *four* questions. 4×5

(a) Show how the analysis of variance technique can be used to test for the significance of the multiple correlation co-efficient in a linear regression set up.

(b) Discuss the role of local control in designing an experiment.

(Turn Over)

(c) Why is a latin square design said to be incomplete ? For such a design, write down the hypothesis you will test and the corresponding analysis of variance table. 1+2+2

(d) What is meant by confounding in factorial experiments ? A 2^4 factorial experiment is carried out in 4 plot blocks with $5n(r \geq 1)$ replications. Th principal block in each replicate is (1), ad, bc, abcd. Write down the factorial effect totals for AD and ABD and explain why the former is confounded but the later is not. 1+2+2

(e) Show that the efficiency of a RBD is always greater than that of CRD.

(f) What is a split plot design ? When do you use it ? 2½+2½

(g) Define linear hypothesis. Explain how valid error is selected in testing a linear hypothesis. 2+3

2. Answer any *two* questions. 2×10

(a) Describe the analysis of covariance for an experiment conducted in a randomised block design with one concomitant variable. How will you test whether the inclusion of the concomitant variable is worth while or not. 5+5

(b) Describe the missing plot technique in design of experiments. In an RBD, one observation is missing. Find an estimate of the missing value.

(c) Describe how on the basis of observed data set (x_i, y_i), $i = 1(1)n$ where Y is the dependent variable and X the independent variable, you will proceed step by step to test.

(i) presence of regression.

(ii) linearity of regression. 5+5

(d) With reference of a 23 experiment with the factors A, B and C, give the structure of the two blocks into which a replicate should be broken so that the effect ABC is confounded. Also show that the following differences of the effects $(A-BC)$, $(B-AC)$ and $(C-AB)$ are mutually orthogonal contrasts among the 4 treatments of the control block of the above (2^3, 2) design confounding ABC. 2+8

[Internal Assessment—10 Marks]

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(b) Name two amylolytic enzymes. What are synthetase and oxidoreductases. Describe the effect of pH on enzyme activity. 2+2+2+1

(c) What is Gibbs free energy ? Explain enthalpy and entropy in this context. 1+3+3

(d) Give an account of counter current mechanism through loop of Henle. 7

(e) Describe the ultrastructure of a skeletal muscle with labelled sketches. 4+3

6. Answer any *three* questions : 3×4

(a) Explain chloride shift. 4

(b) What are the problems of freshwater and marine teleost ? How the problem is overcome by a fresh water telecost ? 2+2

(c) Distinguish between oestrous and menstrual cycle.

(d) Write a short account on ovulation. 4

(e) What are the mechanisms of thermogenesis ? How does it differs from thermolysis ? 2+2

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NEW

Part–III 3-Tier

2019

ZOOLOGY

(Honours)

PAPER—VI

Full Marks : 90

Time : 4 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group—A

1. Answer any *one* question : 1×12

(a) (i) Schematically represent basic steps of Vermitechnology. 6

(ii) Describe the Holiday model of homologous recombination. 6

(b) (i) How will you prove that DNA replication is semi conservative and neither dispersive nor conservative. 8

(ii) Discuss the role of ribosome in translation. 4

(c) What are CAAT box and GC box ? What are their consensus sequence ? State the role of RNase H. How does lagging strand synthesis occur ? (2+2)+3+3+2

2. Answer any *three* questions : 3×7

(a) (i) What are $tRNA_i^{met}$, $tRNA_i$ met and $tRNA^{met}$? 3

(ii) 'Codon is always triplet'—justify. 4

(b) What is C value ? Why it is called a paradox ? Write a short account on selfish DNA. 2+3+2

(c) What are cosmids ? State the role of ligase in recombinant DNA synthesis. What are the characteristic of plasmid ? 2+2+3

(d) What are BACs and state its characteristics ? How are restriction enzymes designated ? 2+3+2

(e) What is the role of PCR in molecular biology ? How does DNA foot printing differs from DNA fingerprinting ? Mention three advantages of biotechnology. 2+2+3

3. Answer any *three* questions : 3×4

(a) Differentiate genomic library and cDNA library. 4

(b) What is Shine-Dalgarno sequence ? State the principle of DNA fingerprinting. 2+2

(c) Write short note on mitochondrial DNA. 4

(d) How proto-oncogenes are activated ? State role of p53. 2+2

(e) Define oncogene. How DNA repair processes and cell cycle checkpoints are intimately linked with cancer ? 2+2

Group—B

4. Answer any *one* question : 1×12

(a) What is Resting potential ? How action potential is developed through depolarisation and repolarisation ? What is saltatory transmission ? Comment on synaptic transmission ? 3+4+2+3

(b) Define Donan equilibrium and state its biological significance. What is Vant Hoff's Law of Osmotic pressure ? What is Tonicity ? 2+3+4+3

(c) How does glucose 6 phosphate formed from lactate ? What is TCA cycle and state why it is amphibolic in nature ? Explain glycogenolysis. 3+3+2+4

5. Answer any *three* questions : 3×7

(a) Describe β-oxidation of unsaturated fatty acid. What is the role of bile salts in absorption of fatty acid from intestine. Why glycerol is not metabolized in adipose tissue ? 3+2+2

Group – C

Answer any **Five** questions from the following : 5×4

15. Differentiate lytic and lysogenic phases in the life cycle of a virus. 4

16. What is a mordant ? Why it is used during staining ? Name the modrant that is used during gram staining. 2+2

17. Write down the functions of oestrogen. 4

18. State the principle of chromatography. 4

19. State the function of T_3 and T_4 in human system. 4

20. Write a short note on hormonal regulation of calcium metabolism. 4

21. State the working principle of a spectrophotometer. 4

22. Write down the principle of Sudan Black staining. 4

23. What is F factor ? Explain the importance of F factor in bacterial conjugation. 1+3

2019

Part – II

ZOOLOGY

(Honours)

Paper – IV

Full Marks – 90

Time : 3 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Answer any **two** questions from the following : 2×15

1. Classify bacteria on the basis of their cell shape and arrangement of flagella. Describe the life cycle of HIV with a labelled diagram. (3+3)+(5+4)

2. Differentiate between 'Null hypothesis' and 'Alternative hypothesis'. What is Yate's correction factor? Find out whether or not the following observed distribution of phenotypes in a sample

of 400 *Drosophila* flies have significant goodness of fit with proposed Mendelian 9:3:3:1 distribution.

Phenotypes :	AB	Ab	aB	ab	Total
Number of individuals :	220	102	54	24	400

[$\chi^2_{0.05(3)} = 7.82$]

Define variance. 3+2+8+2

3. Describe the histology of endocrine pancreas with illustration. Name the hormones secreted from different kinds of cells of pancreas. Describe the mode of action of Insulin. 6+3+6

4. What is the difference between a stain and a dye? Classify dyes with example. What is tissue fixation? What are additive and non-additive fixatives? Give the composition of any fixative and mention the function of its components. 2+6+1+3+3

5. (a) Write down the role of SDS and b-mercapto-ethanol in SDS-PAGE. 4

   (b) Write down the working principle of thin layer chromatography. 5

   (c) What do you understand by Rf value. State Beer and Lambert law. 2×3

Group – B

Answer any **Five** questions from the following : 5×8

6. Write down the principle of gram staining. How does it differ from that of Acid fast staining. 5+3

7. What do you mean by biological pesticides? How they are advantages over chemical pesticides? Write two advantages and two disadvantages of microbial insecticides. 2+2+4

8. State the process of microbial cheese production. 8

9. Calculate the correlation coefficient for the following heights (in inches) of fathers (X) and their sons (Y). 8

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

10. Write a short note on PUBMED and its application in Bio informatics. Write the full form of BLAST. 6+2

11. Explain the histoarchitecture of the thyroid gland. Name two hormones that are produced by posterior pituitary and state one function of each. 4+4

12. Describe the principle of optical microscopy with the help of a diagram. What is resolution of microscope? 6+2

13. How can you differentiate TEM from SEM. State the working principle of phase. Contrast microscope along with a suitable diagram. 4+4

14. Write the scientific name of the plant from which haematoxylane is obtained. How can you prepare haematoxylene in the laboratory? Which part of a cell is stained by haematoxylene and why? 2+4+2

2019

B.Sc. (Hons)

4th Semester Examination

ZOOLOGY

Paper - C8T

Full Marks : 40

Time : 2 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

1. Answer any *five* questions 5×2=10

(a) What do you mean by Wolffian and Mullerian ducts ?

(b) What is foramen of paniza ?

(c) What are remiges and rectrices ?

(d) What is corpus callosum ?

(e) Write the names of ectodermal layers of mammalian skin.

[Turn Over]

(f) Why the number of aortic arches have been reduced in higher vertebrates ?

(g) Distinguish between atlas and axis vertebrae.

(h) What is beleen ?

2. Answer any *four* questions : 4×5=20

(a) Classify different types of dentition in mammals. 5

(b) Describe the structure of heart in dipnoi. 1+4

(c) Distinguish between horn and antler. Write names of the integumentary derivatives of birds. 3+2

(d) Give a general account of succession of kidney in vertebrates. 5

(e) What is jaw suspension ? Give an account of types of jaw suspension in vertebrates. 1+4

(f) Write short notes on (i) air sac in birds and (ii) cloacal bladder in reptiles. 2½+2½

3. Answer any *one* question : 1×10=10

(a) Give a comparative account of aortic arches in amphibians, reptiles and mammals. Mention the significance of aortic arches. 3+3+2+2

(b) Describe the structure of stomach of herbivorous mammal. Add a note on craninal nerves of mammals. 5+5

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2019

Part – II

HISTORY

(Honours)

Paper – III

Full Marks – 90

Time : 4 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

GROUP – A

Answer any **two** questions : 15×2

1. Assen the importance of the Thucydides as a historian.

2. Do you consider Cleisthenes as the real founder and consolidator of the Athenian democracy?

3. What was the political structure of Sparta? Do you agree that Sparta was a class based society?

22. Who were the Dimagagues? How did they affect Athenian politics?

23. Write a short note on Archidamus.

24. How was the structure of the Peloponnesian League.

25. What is meant by eisphora and liturgy?

26. What do you mean by Megarian Decree (432 BC)?

বঙ্গানুবাদ

বিভাগ – ক

যে কোন দুটি প্রশ্নের উত্তর দাও ঃ ১৫×২

১) ঐতিহাসিক হিসেবে থুকিডিডিসের গুরুত্বের মূল্যায়ন কর।

২) তুমি কি মনে কর ক্লাইস্থেনিস এথেনীয় গণতন্ত্রের প্রকৃত প্রতিষ্ঠাতা ও সংগঠক ছিলেন?

৩) স্পার্টার রাজনৈতিক পরিকাঠামো সম্পর্কে আলোচনা কর। তুমি কি মনে কর যে স্পার্টার সমাজ ছিল শ্রেণী নির্ভর?

৪) খ্রীঃ পূঃ পঞ্চম শতকে গ্রীক বাণিজ্য জগতে এথেন্স কিভাবে নিরঙ্কুশ আধিপত্য প্রতিষ্ঠা করতে পেরেছিল?

৫) পেলোপনেশীয় যুদ্ধের (৪৩১-৪০৪ খ্রীঃ পূঃ) দীর্ঘমেয়াদী এবং তাৎক্ষণিক কারণগুলি আলোচনা কর।

৬) কিভাবে গ্রীক বিয়োগান্ত নাটকের উৎপত্তি ও ক্রমোন্নতি ঘটেছিল তা এ্যাসকাইলাস্ ও সফোক্লিসের অবদান উল্লেখ করে আলোচনা কর।

বিভাগ – খ

যে কোন পাঁচটি প্রশ্নের উত্তর দাও ঃ ৮×৫

৭) সোলনের অর্থনৈতিক সংস্কার সম্পর্কে সংক্ষিপ্ত বর্ণনা দাও।

৮) পেরিক্লিস বর্ণিত অন্ত্যেষ্টি সংক্রান্ত ভাষণের সংক্ষিপ্ত বিবরণ দাও।

৯) কাইমন কিভাবে এথেনীয় সাম্রাজ্যকে সম্প্রসারিত করেছিলেন?

১০) প্রাচীন গ্রীসের ক্রীড়ানুষ্ঠান সম্পর্কে তুমি কি জান? সংক্ষেপে লেখ।

১১) ক্লিয়ন ও ডায়োডোটাসের বক্তব্য উল্লেখ করে মিটিলিনী বিতর্কের গুরুত্ব বিশ্লেষণ কর।

১২) কোন অর্থে বলা যায় যে দাসব্যবস্থা গ্রীক সভ্যতার বিকাশের জন্য আবশ্যক ছিল?

১৩) প্লেটো সম্পর্কে একটি সংক্ষিপ্ত প্রবন্ধ লেখ।

১৪) গ্রীক নগররাষ্ট্রগুলির পতনের কারণ বিশ্লেষণ কর।

১৫) গ্রীক ট্রাজেডি নাটকের ক্ষেত্রে ইউরিপাইডিসের অবদান কি ছিল?

১৬) প্রাচীন গ্রীক স্থাপত্যের শৈলী ও বৈশিষ্ট্যগুলি আলোচনা কর।

বিভাগ – গ

যে কোন পাঁচটি প্রশ্নের উত্তর দাও ঃ ৪×৫

১৭) প্রাচীন গ্রীক ইতিহাসে আরক্স এবং এফর কারা ছিলেন?

১৮) সোফিষ্ট কাদের বলা হত?

১৯) ডেলসের রাষ্ট্রসংঘ কেন গড়ে উঠেছিল?

২০) ডেমাগগ্ কারা ছিলেন? তারা কিভাবে এথেনীয় রাজনীতির ওপর প্রভাব ফেলেছিল?

২১) গিলিপ্পাস কে ছিলেন? সংক্ষেপে আলোচনা কর।

২২) ডেমাগগ্ কারা ছিলেন? তারা কিভাবে এথেনীয় রাজনীতির ওপর প্রভাব ফেলেছিল?

২৩) আর্চিডেমাস্ সম্পর্কে একটি টীকা লেখ।

২৪) পেলোপনেশীয় লীগের গঠনতন্ত্র কেমন ছিল?

২৫) এইস্ফোরা এবং লিটারজি বলতে কি বোঝায়?

২৬) মেগারা ডিক্রী (৪৩২ খ্রীঃ পূঃ) বলতে কি বোঝ?

2019

B.Sc.

1st Semester Examination

PHYSICS (Honours)

Paper - C 1-T

(Mathematical Physics)

Full Marks : 40 Time : 2 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practiable.

Group - A

Answer any ***five*** questions : 5×2=10

1. Find whether $d\varphi$ is an exact differential where $d\varphi = \left(x^2 - y\right)dx + xdy$.

2. Show that $\vec{\nabla}\cdot\left(\vec{\nabla}\times\vec{A}\right) = 0$ for any vector $\vec{A}$.

3. If the magnitude of a vector $\vec{A}$ is constant with respect to time, show that $\frac{d\vec{A}}{dt}$ is perpendicular to $\vec{A}$.

4. The random variable x1 follows a Gaussian distribution with mean μ and standard deviation σ_1. A second random variable x2 also follows a Gaussian distribution with same mean μ but different standard deviation $\sigma_2 (> \sigma_1)$. Roughly sketch the two probability density functions.

5. Show that $\delta(kx) = \frac{\delta(x)}{|k|}$, where k is any non-zero constant.

6. A bag contains 10 black balls and 10 red balls. What is the probability of drawing two balls of the same colour ?

7. Solve the equation : $\frac{dy}{dx} + \log_e x^y = 0$.

8. Derive the expression of the volume element dV in spherical polar coordinates.

Group - B

Answer any ***four*** questions. 4×5=20

9. (a) Evaluate $\oint_C \vec{F} \cdot d\vec{r}$ along a closed curve C surrounding the origin and lying in the XY plane for $\vec{F} = \dfrac{\hat{i}x + \hat{j}y}{x^2 + y^2}$.

(b) If $\vec{r}$ be the position vector of a point on a closed contour C, prove that $\oint_C \vec{r} \cdot d\vec{r} = 0$. 3+2

10. (a) Find the order and degree of the following differential equation :

$$\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^{1/2} + xy = 0.$$

(b) Solve the differential equation,

$$\frac{d^2y}{dx^2}\left(e^x + 1\right) + \frac{dy}{dx} = 0. \qquad 2+3$$

11. (a) What do you mean by axial vector ?

(b) Solve the following vector equation for $\vec{y}$:

$K\vec{y}+\left(\vec{y}\cdot\vec{b}\right)\vec{a}=\vec{c}$; $K\neq 0$ and K is a constant scalar while $\vec{a},\vec{b}$ and $\vec{c}$ are constant vectors. 2+3

12. Find a set of vectors reciprocal to the set $\left(2\hat{i}+3\hat{j}-\hat{k}\right),\left(\hat{i}-\hat{j}-2\hat{k}\right)$ and $\left(-\hat{i}+2\hat{j}+2\hat{k}\right)$. 5

13. The probability that a pen made by a company will be defective is 1/10. If 12 such pens are manufactured, determine what will be the probability that

(a) Exactly two will be defective,

(b) At least two will be defective, and

(c) None will be defective. 2+2+1

14. (a) If $\vec{A}$ is irrotational, show that $\vec{A}\times\vec{r}$ is solenoidal.

(b) The potential energy function between two atoms in a diatomic molecule is defined for x > 0 and given by $U(x)=U_0\left[\left(\frac{a}{x}\right)^{12}-2\left(\frac{a}{x}\right)^{6}\right]$, where

U_0 and a are both positive. What will you see the nature of equilibrium during plotting of U(x) vs. x i.e., is it stable or unstable ? 2+3

Group - C

Answer any ***one*** question : 1×10=10

15. (a) State Gauss divergence theorem. 2

(b) If $\vec{A} = ax\hat{i} + by\hat{j} + cz\hat{k}$ where a, b and c are constants. Evaluate $\int_S \vec{A}.d\vec{S}$ where S is the surface of a unit sphere. 3

(c) What is the main characteristic of Poisson distribution ? Give two physical examples where this distribution is applicable. 1+1

(d) Write the expression of probability P(r) related to Poisson distribution with r-success. 1

(e) Let X follow the Poisson distribution such that $P(X=1) = P(X=2)$. Obtain the value of P(X=4). 2

[Turn Over]

16. (a) Solve the differential equation :

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = \frac{e^x}{x}; \; y(1) = 0, \; y'(1) = 1. \quad 4$$

(b) When a force is called conservative ? Is there any chance to get a corresponding potential function ? — Justify with necessary deduction. 1+1

(c) Determine whether the force field given by $\vec{F} = x^2yz\hat{i} - xyz^2\hat{k}$ is conservative or not. 2

(d) Evaluate the integral : $\int_{-1}^{5} \delta(t-2)2e^{4t}dt$. If the lower limit of integration changes to 3, what will be the value of integration ? 1+1

8. Calculate the rest mass and momentum of a photon of energy 5eV. 2

Group - B

Answer any ***four*** questions 4×5=20

9. (a) Find the position of centre of mass of a uniform solid hemisphere. 3

   (b) Show that the areal velocity of a particle moving under central force (i) is constant and (ii) is equal to half of the angular momentum per unit mass of the particle. 2

10. (a) A frame R is rotating with respect to a fixed frame F with angular velocity $\vec{\omega}$. Show that :

$$\left.\frac{d\vec{\omega}}{dt}\right|_R = \left.\frac{d\vec{\omega}}{dt}\right|_F .$$ 3

   (b) A wooden block of mass M is suspended by a string of length l. Initially the block is at rest at its equilibrium position. A bullet of mass m is fired horizontally into the block and is embedded in it. The embedded block-bullet system swings upward and rises till the string makes an angle θ with vertical. Find the velocity of the bullet. 2

11. Find the moment of inertia of a uniform solid cylinder about an axis passing through its centre of mass and perpendicular to its length. Now find the ratio of the length of the cylinder to its radius for which this moment of inertia will be maximum. 3+2

12. A small block of mass 100g is suspended from a rigid support by a massless elastic spring. The system performs damped vertical oscillation of frequency 10Hz and the amplitude reduces to half of the undamped value in one minute. Calculate (i) the resistive force per unit velocity. (ii) the quality factor and (iii) the force constant of the spring. 2+1+2

13. (a) A rod of length 60 *cm* and radius 4 *mm* is rigidly fixed at one end. A torque of 5×10^7 *dyne/cm*^{2} applied at the other end of the rod produces a twist of 4.5°. Find the rigidity modulus of the material of the rod. 2

    (b) Obtain the expression of gravitational intensity due to a uniform thin spherical shell at a point inside it. 3

14. Establish relativistic velocity addition formulae starting from Lorentz transformation equations. 5

(গ) টীকা লেখ (যেকোনো *তিনটি*) :

(i) অপ্রত্যক্ষ অর্থব্যবস্থা,

(ii) ভারতীয় রিজার্ভ ব্যাঙ্ক,

(iii) আর্থিক লিজ,

(iv) অর্থের বাজার,

(v) NABARD.

(ঘ) ভারতের বাণিজ্যিক ব্যাঙ্কগুলির কার্যাবলীর বর্ণনা কর।

(ঙ) ভারতের মূলধনী বাজারের উপাদান ও উপকরণগুলি আলোচনা কর।

[অভ্যন্তরীন মূল্যায়ণ — ১০ নম্বর]

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2019

Part–III

INDIAN FINANCIAL SYSTEM

(Honours in Accounting & Finance)

PAPER—AH-6

Full Marks : 100

Time : 4 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

1. Answer any *five* questions from the following : 5×4

(a) Discuss the role of finance in an economy.

(b) What do you mean by the term 'Money Multiplier'?

(c) "All mutual funds are subject to market risk" — Discuss.

(b) What are the quantitative and qualitative measures of monetary control? Discuss in details.

(c) Write short notes on (any *three*) :

(i) Indirect finance,

(ii) Reserve Bank of India,

(iii) Financial lease,

(iv) Financial market,

(v) NABARD.

(d) State the functions of Commercial Banks of India.

(e) Discuss the constituents and instruments of capital market in India.

[Internal Assessment — 10 Marks]

বঙ্গানুবাদ

দক্ষিণ প্রান্তস্থ সংখ্যাগুলি প্রশ্নমান নির্দেশক।

পরীক্ষার্থীদের যথাসম্ভব নিজের ভাষায় উত্তর দেওয়া প্রয়োজন।

১। যেকোনো *পাঁচটি* প্রশ্নের উত্তর দাও : ৫×৪

(ক) অর্থনীতিতে অর্থব্যবস্থার ভূমিকা ব্যাখ্যা কর।

(খ) 'Money Multiplier' বলিতে কি বোঝ?

(গ) 'সমস্ত মিউচুয়াল ফান্ড বাজারের ঝুঁকি সাপেক্ষ' — আলোচনা কর।

(ঘ) নামিক ও প্রকৃত সুদের পার্থক্য নির্ণয় কর।

(ঙ) 'Cash Reserve Ratio'-এর উপর টীকা লেখ।

(চ) জীবন বীমা ক্ষেত্রে প্রাইভেট সংস্থার উপস্থিতিকে তুমি কি সমর্থন কর? যদি কর তবে কেন?

(ছ) যেকোনো একটি উন্নয়ন ব্যাঙ্কের কার্যাবলী বর্ণনা কর।

(জ) 'নগদহীন লেনদেন আর্থিক লেনদেন নয়' — ব্যাখ্যা কর।

(ঝ) পাঁচটি লিজ পরিসেবার উদাহরণ দাও এবং যেকোনো একটি সম্পর্কে বিশদ আলোচনা কর।

(ঞ) Demat Account কি? Demat Account-এর উপযোগিতা সংক্ষেপে আলোচনা কর।

২। যেকোনো *পাঁচটি* প্রশ্নের উত্তর দাও : ৫×৯

(ক) অর্থব্যবস্থায় অর্থনৈতিক মধ্যস্থকারীর ভূমিকা আলোচনা কর।

(খ) 'EXIM BANK' উপর টীকা লেখ।

(গ) টাকার বাজারের কার্যাবলী বর্ণনা কর।

(ঘ) টীকা লেখ :

(i) গ্রস ও নীট সুদের হার,

(ii) সুদের হারের পরিবর্তনের কারণ।

(ঙ) IRDA-এর উদ্দেশ্য ও কাজ সম্পর্কে আলোচনা কর।

(চ) দেশের শিল্পোন্নয়নে IDBI-এর ভূমিকা সংক্ষেপে আলোচনা কর।

(ছ) মিউচুয়াল ফান্ডের উপযোগিতা বর্ণনা কর।

(জ) সংক্ষেপে 'আর্থিক পরিসেবা' ধারণাটি ব্যাখ্যা কর।

(ঝ) নগদ জমা অনুপাত কি? কেমন করে এটা কাজ করে?

(ঞ) বিভিন্ন ধরণের আর্থিক পরিসেবাগুলি সম্পর্কে আলোচনা করো।

৩। যেকোনো *দুইটি* প্রশ্নের উত্তর দাও : ২×১৫

(ক) 'কোন দেশের অর্থনৈতিক উন্নয়নের সঙ্গে সবসময়ে সুদের হারের সম্পর্ক থাকে না' — আলোচনা কর।

(খ) আর্থিক নিয়ন্ত্রণের সংখ্যাগত ও গুণগত পরিমাপগুলি কি? বিশদে ব্যাখ্যা কর।

খ) তথ্য থেকে সুনামের মূল্য নির্ধারণ কর (ইংরেজী প্রশ্ন দ্রষ্টব্য)।

গ) প্রদত্ত তথ্য থেকে ইক্যুইটি শেয়ারের মূল্য নির্ধারণ কর (ইংরেজী প্রশ্ন দ্রষ্টব্য)।

ঘ) অগ্রাধিকার মুক্ত শেয়ার পরিশোধের জাবেদাগুলি দেখাও (ইংরেজী প্রশ্ন দ্রষ্টব্য)

ঙ) রয়ালিটি হিসাবের ক্ষেত্রে মৃত ভাড়া বলতে কি বুঝ? এই ভাড়া জমিদারের হিসাব বহিতে বিভিন্ন ক্ষেত্রে কেমনভাবে লিপিবদ্ধ করবে তা উদাহরণসহ লিখ।

চ) একত্রিকরণ ও গ্রসন বলতে কি বুঝ? গ্রসিত কোম্পানীর বহিবন্ধ করার জন্য জাবেদাগুলি লিখ।

৪। যে কোন দুটি প্রশ্নের উত্তর দাও : ২×১২

ক) নিম্নলিখিত তথ্য থেকে একত্রিত উর্দ্ধতপত্র প্রস্তুত কর (ইংরেজী প্রশ্ন দ্রষ্টব্য)

খ) A Ltd ও B Ltd একত্রিত হয়ে AB Ltd তৈরী হয়েছে। নিম্নলিখিত তথ্য থেকে AB Ltd বহিতে হিসাব খোলার দাখিলা দেখাও ও নতুন উদ্ধতপত্র প্রস্তুত কর (ইংরেজী প্রশ্ন দ্রষ্টব্য)

গ) কোম্পানী চূড়ান্ত হিসাব প্রস্তুত ও উপস্থাপনের জন্য উপাদানগুলি কি কি? ভারতীয় কোম্পানী আইন অনুযায়ী লাভক্ষতির হিসাব প্রস্তুতের উপাদানগুলি কি কি?

(অভ্যন্তরীণ মূল্যায়ন — ১০ নম্বর)

2019

Advance Financial Accounting

(Honours)

Paper – AH3

Full Marks – 100

Time : 4 Hours

The questions are of equal value for any group / half.
The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answers wherever necessary.

1. Give answer of any three questions : 3×6

a) What is the procedure of setting Accounting Standards in India? 6

b) Write a short note on Indian AS7. 6

c) What do you mean by IASB? Why it has been formed? 2+4

d) What do you mean by Accounting Standard? What is its importance ? 3+3

e) Give the objectives of IFRS.

f) Write a brief note on the implementation of IFRS in India.

GROUP – B

2. **Give answer of any four questions :** 4×4

a) Distinguish between Amalgamation and Absorption.

b) What do you mean by Average Clause? Give answer with example.

c) Distinguish between Ex-Interest and cum-Interest.

d) Show the journal for the issue of 10% Debenture of Rs. 100000 at 10% discount and to be redeemed at 15% premium.

e) What are the qualitative characteristics of Financial statement?

f) Is there any relation between super profit and goodwill? Discuss.

3. **Give answer of any four questions :** 4×8

a) PBM Ltd. insured a loss of profit policy for Rs. 20000. A fire occured on 30.12.2018. From the following particulars calculate the amount of Insurance claim. Sales for the year ended 31.3.18 is Rs. 360000/-. Net loss for the year ended 31.3.18 Rs. 60000/-. Sales during the period of dislocation from 30.12.18 to 30.3.2019 Rs.10000/-.

Insured standing charges Rs. 40000/- Total standing charges Rs 100000/-, sales during the last year to the period of dislocation on Rs. 60000/-. Sales for the year ending 30.12.18 Rs. 600000/-.

b) TB Ltd commenced business in the year 2014 with a paid up capital of Rs 2,50,000/-. During the last five years the company earn profits

before income Tax (assume 50%) Rs 61000, Rs. 64000/-, Rs. 72000/-, Rs. 80000/- and Rs. 86000/-.

The total assets of the company was Rs 5,00,000/- in the year ended 31.3.2019 with external liabilities of Rs 170000/- and the goodwill was Rs 30000/- with the total assets. The company pays 10% average dividend during last five years and this rate can be considered as reasonable expected return.

Ascertain the value of goodwill from the above information.

c) The balance sheet of SG Ltd shows the following position as on 31.3.19.

	Rs.		Rs
Issued Capital			
(of Rs 10 each)	4,00,000	Fixed Assets	500000
General Reserve	90,000	Goodwill	40,000
P/L A/C	20,000		
10% debenture	100,000	Current Assets	2,00,000
Creditors	1,30,000		
	7,40,000		7,40,000

As on 31.3.19 fixed assets valued at Rs. 3,50,000/- and the goodwill at Rs 50000/-. The net profits of the company during last three years were Rs. 52000/-, Rs. 53000/- and Rs.60000/-. The company transfer 20% to reserve. The fair rate of return may be taken at 10%.

Calculate the value of shares by (i) Assets Backing Method and (ii) Yield Method.

d) The following balances are appeared in the Balance Sheet of SB Ltd as on 31.12.18.

	Rs.	Rs
Redeemable Prof. Share Cap.5,00,000 (of Rs 100 each)		
Ln: Calls in Arrear on 500 shares–10,000		490,000
Development Rebate Reserve		2.00,000
Share Premium		40,000
General Reserve		3,00,000

Preferance Shares to be redeemed at a premium of 10%, The arrears shareholders are not traceble, Rs 50000/- of Development Rebate reserve is free for the distribution of Dividend. For the purpose of redemption, the company will utilise the General Reserve and Share premium fully and the balance to be financed by the issue of equity shares of Rs 10 each at par.

Show the necessary journal entries.

e) What do you mean by Dead Rent in Royalty Accounts. How the Dead Rent is treated in the book of Landlord in different siturations. Give your answer with imaginary figures.

f) Define Amalgamation and Absorption. What entries are passed by a company to close its books when it is absorbed by another company?

4. Give answer of any two questions : 2×12

a) From the following informations prepare consolidated Balance Sheet as on 31.12.18.

	A Ltd	B Ltd		A Ltd	B Ltd
	Rs	Rs		Rs	Rs
Share Capital (of Rs10 each)	5,00,000	1,00,000	Fixed Assets	4,00,000	60,000
Reserve	60,000	30,000	Stock	3,00,000	1,55,000
P/LA/C	2,00,000	60,000	Debtors	1,05,000	85,000
B/P	—	15,000	B/R	20,000	—
Creditors	1,40,000	95,000	Investment in B Ltd	75,000	—
	9,00,000	3,00,000		9,00,000	3,00,000

Additional information,

i) On the date of holding by A Ltd, the balance of Reseve of B Ltd was Rs 30,000 and all the profit earned by B Ltd since it were acquired by A Ltd.

ii) All the B/P of B Ltd are in favour of A Ltd.

iii) The stock of A Ltd includes Rs 25000 purchased from B Ltd at a profit of 25% on cost.

b) The A Ltd and B Ltd are two companies carrying business in the same category. They decided to amalgamate and form a new Company called AB Ltd. From the given information show the journal entries to open the book of AB Ltd and the New Balance Sheet resultant therein.

	A Ltd	B Ltd		A Ltd	B Ltd
	Rs	Rs		Rs	Rs
Equity Share Capital (of Rs10 each)	6,00,000	2,00,000	Fixed Assets	8,00,000	3,00,000
Reserve	4,00,000	2,00,000	Investment	1,00,000	—
Mortgage loan	6,00,000	1,00,000	Stock	9,00,000	4,00,000
			Debtors	3,00,000	1,00,000
Current Liabilities	6,00,000	4,00,000	Bank	1,00,000	1,00,000
	22,00,000	9,00,000		22,00,000	9,00,000

Further information,

i) All assets and liabilities to be taken by AB Ltd except investment of A Ltd which was sold by A Ltd at a profit of 10%.

ii) The value of equity shares of A Ltd and B Ltd are Rs 15 and Rs 25 respectively.

iii) AB Ltd issued 5000 equity shares of Rs 10 each at premium of 10%

c) What are the requirements for preparation and presentation of company final Accounts? Give the requirements as to Profit & Loss A/c as per Company Act of India.

(Internal assessement : 10 marks)

বঙ্গানুবাদ

বিভাগ – ক

১। যে কোন তিনটি প্রশ্নের উত্তর দাও : ৩×৬

ক) ভারতবর্ষে হিসাবনিকাশ করণের মান কিভাবে নির্ধারিত হয়?

খ) ভারতীয় AS7 সম্বন্ধে টীকা লেখ।

গ) IASB বলতে কি বুঝ? কেন ইহা তৈরী হয়েছে?

ঘ) হিসাবনিকাশ করণের মান বলতে কি বুঝ? ইহার গুরুত্ব কি?

ঙ) IFRS এর উদ্দেশ্যগুলি কি?

চ) ভারতবর্ষে IFRS চালুর বিষয়ে সংক্ষিপ্ত টীকা লেখ।

বিভাগ – খ

২। যে কোন চারটি প্রশ্নের উত্তর দাও : ৪×৪

ক) একত্রিকরণ ও গ্রসনের মধ্যে পার্থক্য কর।

খ) গড়পড়তার ধারা বলতে কি বুঝ ? উদাহরণসহ উত্তর দাও।

গ) Ext-Int ও Cum-Int এর মধ্যে পার্থক্য কর।

ঘ) জাবেদা দেখাও। (ইংরেজী প্রশ্নের)

ঙ) আর্থিক বিবরণীর গুণগত বৈশিষ্ট্য কি কি?

চ) অতি মুনাফার সঙ্গে সুনামের কোন সম্পর্ক আছে কি? আলোচনা কর।

৩। যে কোন চারটি প্রশ্নের উত্তর দাও : ৪×৮

ক) আগুন লাগার ফলে মুনাফার (তির জন্য বীমা দাবীর পরিমাণ নির্ধারণ কর। (ইংরেজী প্রশ্ন দেখ)

P.T.O.

b) Explain the structural features of PSI and PSII. Differentiate between cyclic and non-cyclic photo-phosphorylation. Explain the carbon assimilation process present in C_4 plants. 4+4+7

c) Explain the role of any three macro elements and any three trace elements required for plant nutrition and show how their deficiency affect plant growth. What are the significance of osmosis and water potential in plant life. 6+6+3

d) Name the 6-carbon, 5-carbon and 4-carbon compounds that are produced during Kreb's Acid Cycle. Name the steps of oxidation in that cycle. Is it possible to produce 4ATP molecules by utilizing only 2ATP molecules during glycolysis? How? Describe briefly the steps of Acetyl COA formation form one molecule of pyruvic acid. 6+1+3+5

2019

Part – II

BOTANY

(Honours)

Paper – IV

Full Marks – 90

Time : 4 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Group – A

1. Answer any **ten** of the following : 2×10=20

a) What are Pr and Pfr?

b) Whar is RQ?

c) What is 'Z' Sheme?

d) What is edge effect?

e) What is biomass?

f) What does it mean by social forestry?

g) What is hill reaction?

h) What do you mean by Green House Effect?

i) Why C_4 plants are phtosynthetically more efficient than C_3 plants?

j) What are the full forms of PUFA and MUFA?

k) Define water potential.

l) What do you mean by Gibb's free energy?

m) What is SPAC?

n) What is α-oxidation?

o) What are domains and motifs?

Group–B

2. Answer any **five** of the following : 8×5=40

a) What is the importance of K^+ in opening and closing of stomota? Write the significance of transpiration in a plant life. 5+3

b) Distinguish between (any **four**) : 2×4

i) Salt respiration and phororespiration.

ii) Mass flow and pressure flow hypothesis.

iii) CAM and SAM.

iv) 'nif' gene and 'nod' gene.

v) Competitive and noncompetitive enzyme inhibition.

vi) Halophytes and heliophytes.

c) Give an outline classification of the types of seed dormancy. Explain the different methods of breaking seed dormancy. 5+3

d) Write a note on the chemical nature and role of phytochrome in flowering. What is florigen? 6+2

e) What does it mean by stress and stress physiology? Give an account of salt stress and water stress in relation to plant metabolism. 1+1+6

f) Write outline mechanism and significance of photorespiration. What are LSDP and SLDP – give example. 6+2

g) What are fats? How these are synthesized in plants? Differentiate staurated falty acids from common falty acids. 2+3+3

h) Define auxins. Name two growth promoting and two growth retarding plant hormones. Write the physiological role of IAA and GA in plants. 2+2+4

Group – C

3. Answer any **two** of the following : 15×2=30

a) What does it mean by hydrogen bonding? How it help to explain many of the unique physical and chemical properties of water? What is dipole moment of water? What is buffer? Name two buffer solutions. 2+6(3+3)+3+2+2

2019

B.Sc. (Hons.)

4th Semester Examination

BOTANY

Paper - C8T

Molecular Biology

Full Marks : 40 Time : 2 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

1. Answer any *five* questions of the following : 5×2=10

(a) What is primosome?

(b) Differentiate between sense and antisense RNA.

(c) What is replication slippage?

(d) Define micro RNA.

(e) What is Cot curve?

[Turn Over]

(f) What is negative control of gene regulation?

(g) Give an example of self splicing intron.

(h) What is nuclesome?

2. Answer any *four* of the following : 4×5=20

(a) What is Adaptor Hypothem? Explain the role of various enzymes involved in DNA replication. 2+3

(b) Mention in brief the functions of different types of RNAs. 5

(c) Explain with illustration the negative control of Lac operon. 2+3

(d) Compare the process of ribosome biogenesis in eukaryotes and prokaryotes. 2.5+2.5

(e) Define transcription : State the functions of TFIID, TFIIF, TFIIE and TFIIH in enkaryotic transcription. 1+4

(f) Write the function of aminoacyl tRNA synthetase? Explain the regulation of tryptophan synthesis in etalize. 1+4

3. Answer any *one* questions of the following : 1×10=10

(a) Justify that the genetic code is non-overlapping. Explain degeneracy and Wobbles' hypothesis. 4+6

(b) Write a note on replisome and its importance in prokaryotes. How is the end part of eukaryotic chromosome replicated? 5+5

(b) With suitable diagrams describe the structural peculiarities and the consequences of different types of chromosomal aberrations.

Describe how 5-Bromouracil and Nitrous acid act as a chemical mutagen to DNA.

What is tautomeric shift ? 10+3+2

(c) Mention the importance of Transgenic plants. Write in detail about the transgenic plants citing one suitable example. Distinguish between Ti and Ri plasmids. Discuss the mode of action of Bt Toxin. 1+8+3+3

(d) Distinguish organogenesis and embryogenesis. Discuss on the application of recombinant DNA technology in human welfare. Mention the characteristics of a crop ideotype. 5+5+5

NEW

Part–III 3-Tier

2019

BOTANY

(Honours)

PAPER—VI

Full Marks : 90

Time : 4 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group—A

1. Answer any *ten* questions : 2×10

(a) What is numerical aperture ?

(b) What is G_0 stage ?

(c) State the components of nucleosome complex. What is chromatosome ?

(d) What is cis and trans faces of Golgi ?

(e) What is basic chromosome number ?

(f) What are restriction enzymes ?

(g) How does transpason differ from retrausposons ?

(h) Why the genetic code called degenerate ?

(i) What are synthetic seeds ?

(j) Mention two implications of χ^2-test.

(k) Write the abbreviation of $2n + 1-1$.

(l) Distinguish between test cross and back cross.

(m) What is synaptonemal complex ?

(n) What are Okazaki fragments ?

(o) Mention the procedure of linkage mapping. How does a double trisomy differ from tetrasomy ?

Group—B

2. Answer any *five* questions : 8×5

(a) Structurally how does DNA differ from RNA ? Name the different types of DNA known so far. Describe the structure of a t-RNA molecule. 1+3+4

(b) With suitable sketches describe the ultrastructu and functions of mitochondria. Why is it called as semiautonomous ? 6+2

(c) With suitable example explain dominant type of gene interaction. Distinguish between complementary and supplementary type of gene interaction. 4+(2+2)

(d) Mention the advantages of using Biofertilizer over chemical fertilizer. What are carriers ? Add a note on mass production of Biofertilizer. 2+2+4

(e) What is Triticale ? Write in brief about the importance of polyploidy in crop improvement. 2+6

(f) What is organogenesis ? Describe the method of protoplast culture and state its importance. 1+4+3

(g) Distinguish between mean, median and mode. Define variance and relate it with standard deviation. 6+1+1

(h) Write in brief about the steps followed by plant hybridization. Explain dominance and over dominance hypothesis. 4+4

Group—C

3. Answer any *two* questions : 2×15

(a) "Meiotic deviation is partly reductional and partly equational"—Explain it with suitable sketches. Mention the roles of MPF and CDK in the regulation of cell cycle. With suitable examples describe the cytological crossing over. 6+2+7

2019

B.Sc. (Hons.)

1st Semester Examination

PHYSICS (Honours)

Paper—C 1-P

Full Marks : 20 Time : 3 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Attempt any one set of questions from the following : 15 Marks

Total Marks = 20 [Programming, execution, I/O (or graphical display) = 15, Viva + LNB = 5]

Each Question has two parts and carries 10 marks (5+5).

Instructions :

- Write the necessary formula and algorithmic steps.
- Write a clear Python Script (in a file or on interpreter).
- Print the Input and Output.
- Display you result graphically if asked.

1. (i) Create a list of 50 random integers between [1, 10]. Compute the sum and mean of that numbers. [Hint : Use 'randint ( )' function from 'random' module.]

(ii) Let an ellipse be given by $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, where we assume that a < b. Compute the parameter (L) of the ellipse where, $L = 4b\int_0^{\pi/2}\sqrt{1-k^2\sin^2\theta}\,d\theta$, where $k^2 = 1 - \frac{a^2}{b^2}$. You may take any value of a and b as input. Use composite Simpson's 1/3 rule to evaluate.

2. (i) In an experiment you recorded some values for some quantity x as the following : 0.98, 1.01, 1.03, 0.96, 1.10, 0.87, 0.89, 1.0, 1.05, 1.11. Compute the standard deviation, $\sigma = \sqrt{\overline{x^2} - \overline{x}^2}$. Also calculate the error bar $\varepsilon = \sigma/\sqrt{n}$.

(ii) Write a Decaying equation for radioactive decar : $\frac{dM}{dt} = -\lambda M$, with $\lambda = 2$, $M(0) = 100$. Solve this by Euler method and plot the solution.

3. (i) A set of 20 numbers are given : 1, 0.1, 5, 3, 10, –1, 4, 20, 100, –9, 2, 14, 4.5, 0.9, 30, 9.8, 11, 22, 48, –10. Write a computer program to count how many numbers are there between 0 to 10 (the upper and lower limits excluded).

(ii) Estimate f(13), given the following table of values :

x	10	12	14	16	18	20
y = f(x)	46	66	81	93	101	108

Use Newton-Gregory Forward difference formula for interpolation.

4. (i) Define a function to compute factorial of an integer. Then use this to find our $\binom{m}{n}$, where m 15, n = 6.

(ii) A population growth model is given by $\frac{du}{dt} = \alpha u (1 - u/R)$, where $\alpha > 0$ and R is the maximum possible value of R. Set the values of α and R yourself and solve the equation by Runge-Kutta 4^{th} order method to print u t different t.

5. (i) Given, $z_1 = 4 - 3j$ and $z_2 = -1 + 2j$, evaluate (i) $|4z_1 - 3z_2|$. (ii) $\sqrt{z_1 z_2}$.

(ii) Find out at least one root of the equation : $f(x) = x^3 - x^2 - 2x + 1$ by bisection method.

6. (i) Starting with $x_0 = 0$ and $x_1 = 1$, generate 20 Fibonacci numbers with the sequence : $x_{n+1} = x_n$

$+ x_{n1}$ and then calculate the sum series sum :

$$S = \Sigma \frac{1}{x_n^2}.$$

(ii) Compute the following integral to verify the expression : $\int_0^{\pi} \frac{x}{x^2+1} \cos(10x^2) = 0.0003156.$

Use composite Simpson's 1/3rd rule. Comment on how your solution can be improved.

7. (i) Calculate the sum $\sum_{k=0}^{\infty} \frac{1}{n^k}$

for n = 2 with an accuracy level of 4 decimal places.

(ii) Compute the following integral :

$$\int_{-\pi/3}^{\pi/3} x^3 \tan x \, dx$$

Use composite Simpson's 1/3 rule. Check your result by increasing the subintervals and comment on the observation how it approaches towards accurate result.

8. (i) Given a string 'university', count how many vowels are there in the string.

(ii) The equation for projectile motion is,

$$u'' = -\frac{k}{m} u' + g$$

Here g = 9.81 (unit), acceleration due to gravity. Take mass, m = 5 (unit) and k = 0.8. Find out the solution and plot the trajectory. Solve this by Euler method.

9. (i) Write a python script to evaluate $\Gamma\left(\frac{21}{2}\right)$, where

$$\Gamma(n + 1/2) = \frac{1.3.5....(2n-1)}{2^n}\sqrt{\pi}.$$

(ii) Solve : $\frac{dy}{dx} + y = x$, $y(0) = 1$ by RK4 method.

10. (i) Find $C = 4A - 3B$, where

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}, \quad B = \begin{pmatrix} 9 & 8 & 7 \\ 6 & 5 & 4 \\ 3 & 2 & 1 \end{pmatrix}$$

(ii) Use the Newton-Raphson method to find the smallest and the second smallest positive roots of the equation $\tan\theta = 4\theta$, correct up to 4 decimal places.

11. (i) Given a number 38479297483, check if this is a palindrome number. [Hint : You may treat the number as a string.]

(ii) Evaluate the following differential equation by RK4 method :

$$e^y \frac{dy}{dx} + x^2y^2 = 2\sin(3x), \; y(0) = 5$$

Print the values of (x, y) on screen. Print the output (x, y) in separate lists.

12. (i) Find out f (10), where f (n) + f (n – 1) + 10 and f (0) = 1.

(ii) Given a list of θ-values (in radian) in [0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5] and the corresponding sin (θ) values in [0, 0.48, 0.84, 1.0, 0.91, 0.60, 0.14, –0.35], use any kind of interpolation method to find out sin (1.8).

13. (i) Given a list of number [2.0 –1.2, 3.4, 9.1, 0.1, –5.8, –4.2, 3.9, 10.4, 1.9, –3.8, –9.6], take numbers with index no. 4 to 8 (end elements included) by slicing. Check if the sum of this sliced list of numbers is more or less than the sum of all the numbers in the original list.

(ii) Using Simpson's 1/3 rd rule, calculate

$$\int_{-0.5}^{0.8} x^3 \sqrt{1-x^2}\, dx,$$

correct up to 3 decimal places.

14. (i) Given the list of numbers : [–1, 4, –3.8, –8.9, –10, 10, 22, 9, –2, 9.2], write a python script to read the list and print two separate lists consisting of positive and negative numbers.

(ii) Approximate $\int_1^3 e^{x^2} dx$ using Simpson's rule for n = 8. where

	x_0	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8
x =	1	1.25	1.5	1.75	2	2.25	2.5	2.75	3

15. (i) Find the value of π from the infinite series : $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} + \ldots$ up to 6^{th} decimal point of accuracy.

(ii) Using Trapezoidal rule, evaluate : $\int_0^2 xe^{-x^2}$ taking 100 and 1000 subintervals.

16. (i) Given a continued fractions,

$$S = 3 - \cfrac{2}{3 - \cfrac{2}{3 - \cfrac{2}{3 - \ldots}}}$$, write a recurrence relation to find out the terminating value of S. Start from any guess value other than 1.

(ii) Write a program using the Newton-Raphson method to determine the roots of the equation : $f(x) = x^3 - x^2 - 2x + 1$.

17. (i) Given the matrix, $A = \begin{pmatrix} 2 & -5 & -11 & 0 \\ -9 & 4 & 6 & 13 \\ 4 & 7 & 12 & -2 \end{pmatrix}$, compute A^T.

(ii) A ball at 1200 K is allowed to cool down in air at an ambient temperature of 300 K. Assuming heat is lost only due to radiation, the differential equation for the temperature of the ball is given by

$$\frac{d\theta}{dt} = -3.58\times10^{-12}\left(\theta^4 - 81\times10^8\right),\ \theta(0) = 1200\text{K}$$

where θ is in K and t in seconds. Find the temperature at t = 480 seconds using RungeKutta 4th order method. Assume a step size of h = 10 seconds.

2019

B.Sc.

1st Semester Examination

PHYSICS (Honours)

Paper - C 1-T

(Mathematical Physics)

Full Marks : 40 Time : 2 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practiable.

Group - A

Answer any ***five*** questions : 5×2=10

1. Find whether $d\varphi$ is an exact differential where $d\varphi = \left(x^2 - y\right)dx + xdy$.

2. Show that $\vec{\nabla}\cdot\left(\vec{\nabla}\times\vec{A}\right) = 0$ for any vector $\vec{A}$.

3. If the magnitude of a vector $\vec{A}$ is constant with respect to time, show that $\frac{d\vec{A}}{dt}$ is perpendicular to $\vec{A}$.

4. The random variable x1 follows a Gaussian distribution with mean μ and standard deviation σ_1. A second random variable x2 also follows a Gaussian distribution with same mean μ but different standard deviation $\sigma_2 (> \sigma_1)$. Roughly sketch the two probability density functions.

5. Show that $\delta(kx) = \frac{\delta(x)}{|k|}$, where k is any non-zero constant.

6. A bag contains 10 black balls and 10 red balls. What is the probability of drawing two balls of the same colour ?

7. Solve the equation : $\frac{dy}{dx} + \log_e x^y = 0$.

8. Derive the expression of the volume element dV in spherical polar coordinates.

Group - B

Answer any ***four*** questions. 4×5=20

9. (a) Evaluate $\oint_C \vec{F} \cdot d\vec{r}$ along a closed curve C surrounding the origin and lying in the XY plane for $\vec{F} = \dfrac{\hat{i}x + \hat{j}y}{x^2 + y^2}$.

(b) If $\vec{r}$ be the position vector of a point on a closed contour C, prove that $\oint_C \vec{r} \cdot d\vec{r} = 0$. 3+2

10. (a) Find the order and degree of the following differential equation :

$$\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^{1/2} + xy = 0.$$

(b) Solve the differential equation,

$$\frac{d^2y}{dx^2}\left(e^x + 1\right) + \frac{dy}{dx} = 0. \qquad 2+3$$

11. (a) What do you mean by axial vector ?

(b) Solve the following vector equation for $\vec{y}$:

$K\vec{y}+\left(\vec{y}\cdot\vec{b}\right)\vec{a}=\vec{c}$; $K\neq 0$ and K is a constant scalar while $\vec{a},\vec{b}$ and $\vec{c}$ are constant vectors. 2+3

12. Find a set of vectors reciprocal to the set $\left(2\hat{i}+3\hat{j}-\hat{k}\right),\left(\hat{i}-\hat{j}-2\hat{k}\right)$ and $\left(-\hat{i}+2\hat{j}+2\hat{k}\right)$. 5

13. The probability that a pen made by a company will be defective is 1/10. If 12 such pens are manufactured, determine what will be the probability that

(a) Exactly two will be defective,

(b) At least two will be defective, and

(c) None will be defective. 2+2+1

14. (a) If $\vec{A}$ is irrotational, show that $\vec{A}\times\vec{r}$ is solenoidal.

(b) The potential energy function between two atoms in a diatomic molecule is defined for x > 0 and given by $U(x)=U_0\left[\left(\frac{a}{x}\right)^{12}-2\left(\frac{a}{x}\right)^{6}\right]$, where

U_0 and a are both positive. What will you see the nature of equilibrium during plotting of U(x) vs. x i.e., is it stable or unstable ? 2+3

Group - C

Answer any ***one*** question : 1×10=10

15. (a) State Gauss divergence theorem. 2

(b) If $\vec{A} = ax\hat{i} + by\hat{j} + cz\hat{k}$ where a, b and c are constants. Evaluate $\int_S \vec{A}.d\vec{S}$ where S is the surface of a unit sphere. 3

(c) What is the main characteristic of Poisson distribution ? Give two physical examples where this distribution is applicable. 1+1

(d) Write the expression of probability P(r) related to Poisson distribution with r-success. 1

(e) Let X follow the Poisson distribution such that $P(X=1) = P(X=2)$. Obtain the value of P(X=4). 2

[Turn Over]

16. (a) Solve the differential equation :

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = \frac{e^x}{x}; \; y(1) = 0, \; y'(1) = 1. \quad 4$$

(b) When a force is called conservative ? Is there any chance to get a corresponding potential function ? — Justify with necessary deduction. 1+1

(c) Determine whether the force field given by $\vec{F} = x^2yz\hat{i} - xyz^2\hat{k}$ is conservative or not. 2

(d) Evaluate the integral : $\int_{-1}^{5} \delta(t-2)2e^{4t}dt$. If the lower limit of integration changes to 3, what will be the value of integration ? 1+1

8. Calculate the rest mass and momentum of a photon of energy 5eV. 2

Group - B

Answer any ***four*** questions 4×5=20

9. (a) Find the position of centre of mass of a uniform solid hemisphere. 3

   (b) Show that the areal velocity of a particle moving under central force (i) is constant and (ii) is equal to half of the angular momentum per unit mass of the particle. 2

10. (a) A frame R is rotating with respect to a fixed frame F with angular velocity $\vec{\omega}$. Show that :

$$\left.\frac{d\vec{\omega}}{dt}\right|_R = \left.\frac{d\vec{\omega}}{dt}\right|_F .$$ 3

   (b) A wooden block of mass M is suspended by a string of length l. Initially the block is at rest at its equilibrium position. A bullet of mass m is fired horizontally into the block and is embedded in it. The embedded block-bullet system swings upward and rises till the string makes an angle θ with vertical. Find the velocity of the bullet. 2

11. Find the moment of inertia of a uniform solid cylinder about an axis passing through its centre of mass and perpendicular to its length. Now find the ratio of the length of the cylinder to its radius for which this moment of inertia will be maximum. 3+2

12. A small block of mass 100g is suspended from a rigid support by a massless elastic spring. The system performs damped vertical oscillation of frequency 10Hz and the amplitude reduces to half of the undamped value in one minute. Calculate (i) the resistive force per unit velocity. (ii) the quality factor and (iii) the force constant of the spring. 2+1+2

13. (a) A rod of length 60 *cm* and radius 4 *mm* is rigidly fixed at one end. A torque of 5×10^7 *dyne/cm*^{2} applied at the other end of the rod produces a twist of 4.5°. Find the rigidity modulus of the material of the rod. 2

    (b) Obtain the expression of gravitational intensity due to a uniform thin spherical shell at a point inside it. 3

14. Establish relativistic velocity addition formulae starting from Lorentz transformation equations. 5

2019

B.Sc.

1st Semester Examination

PHYSICS (Honours)

Paper—C 2-P

Full Marks : 20 Time : 3 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

1. Determine the Moment of Inertia of Flywheel.

   (a) Working Formala. 3

   (b) Data for the radius of the shaft by slide calliperse (Find v.c. for slide calliperse) 1+2

   (c) Data for h by meter scale. 1

   (d) Data for time of fall two different loads. 3

   (e) Data for number of rotation of the flywheel. 3

   (f) Calculate the moment of Inertia. 2

2. Determine the Modulus of Rigidily of a wire by Maxwell's needle (Length of the wire will be supplied)

   (a) Working Principal 3

   (b) Data for the radious of wire by screw gauge. (Determine least count for screw gauge) 1+2

   (c) Determine the mass of the hollow and solid cylinder. 2

   (d) Data for time period for solid cylinders outside the needle and inside the needle (T_1 and T_2) [Measure time for at least 10 oscillation for three observation] 6

   (e) Calculate of rigidity modulus. 1

3. Determine the Young's Modulus of a wire by optical lever method. (length of the arm of a optical lever are to be supplied)

   (a) Working principle. 3

   (b) Data for the radius of the wire by screw gauge. 1+2

(c) Data for load depression graph (5 loads) by optical lever method. 5

(d) Draw load depression graph. 2

(e) Calculation Young's Modulus (Y) from graph. 2

4. Measure the internal diameter of a capillary Tube.

(a) Screw-gauge and Travelling microscope. 3

(b) Data for least count of screw gauge. 2

(c) Data for diameter by screw gauge. 3

(d) Data for vernier constant of travelling microscope. 7

5. To determine g by Bar Pendulum.

(a) Working principal. 3

(b) Data T vs d graph [measure time at least 15 oscillations] 7

[Turn Over]

(c) Draw graph for T vs d. 3

(d) Calculation of g from graph. 2

6. Determine the elastic constants of a wire by Searle's method. [length and depth of bars will be supplied]

(a) Working Formula for γ, η and σ. 4

(b) Data for the radius of the wire by screw-gauge. 1+2

(c) Data for Time periods of vertical and horizontal oscillations. (At least 20 oscillations for each) 5

(d) Calculation of γ, η and σ. 3

7. Determine the value of g using Keter's Pendulum.

(a) Working formula. 3

(b) Preliminary records of times of oscillations during adiustment of positions of cylinders. 5

(c) Data for final time periods T_1 and T_2. 3

(d) Data for distances l_1 and l_2. 2

(e) Calculation of g. 2

8. To determine g and velocity for a freely falling body using 'digital timing technique'.

(a) Theory and working formula. 3

(b) Recording of height and time (T) of free falling for five different heights for first body. 3

(c) Recording of same for second body of different mass. 3

(d) Graphs of height (h) vs. T^2. 2

(e) Determined g from graph. 2

(f) Calculation of velocity of falling when touches the surface for both mass [Take and height(h)] 2

9. Determine the height of a vertical distance between two points using sextant.

   (a) Working formula. 2

   (b) Vernier constant. 2

   (c) Reading of base point and vertical point for three horizontal distance (d) [by measuring tape or metre scale] 6

   (d) Table for $\tan\theta$ vs $\frac{1}{d}$ graph and plot of the graph. 1+2

   (e) Calculation of height (h) the graph. 2

10. Determine co-efficient to viscosity of water by capillary flow method (Poiseuille's Method)

   (a) Working Formula. 3

   (b) Data record for h. 6

   (c) Calculation with necessary plots. 6

Distribution of Marks

Experiment	15 marks
Laboratary Note book	02 marks
Viva voce	03 marks
Total	*20 marks*

UG/1st Sem/PHS(H)/T/19

2019

B.Sc.

1st Semester Examination

PHYSICS (Honours)

Paper - C 2-T

Full Marks : 40 Time : 2 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practiable.

Group - A

Answer any ***five*** questions 5×2=10

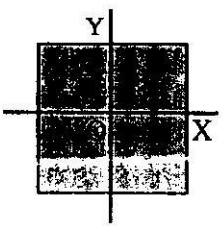
1. Assume that Newton's 2nd law is valid in a reference frame and rest. Now show that it is valid in any reference frame moving with constant velocity. 2

2. A bullet is fired with initial velocity 100 *m/s* making an angle 45° with horizontal. If $g = 10$ m/s^2 then calculate the maximum horizontal distance travelled by the bullet before touching the ground. 2

[Turn Over]

3. A particle moves on X-axis under a potential $V = -\frac{A}{x^n} + \frac{B}{x^2}$. Show that the condition for a stable equilibrium position of the particle on the X axis is $n < 2$. 2

4. A uniform square lamina is lying in the XY plane as shown in the following figure. Given : $I_Y = \frac{1}{12}ma^2$. Find the moment of inertia of the lamina about an arbitrary axis, also lying in the XY plane and passing through the centre of the lamina. 2



5. Show that the total mechanical energy of a particle moving under conservative force is constant. 2

6. Obtain Stokes' law of viscosity by dimensional analysis. 2

7. For an elastic material the Young's Modulus and the Poisson's ratio have the values 7.2×10^{10} N/m^2 and 0.25 respectively. Calculate the modulus of rigidity. 2

Group - C

Answer any ***one*** question $1\times10=10$

15. (a) Using Newton's law of gravitation prove Kepler's 1st law of planetary motion. 3

    (b) Show that the potential of the central force is spherically symmetric. 2

    (c) A spaceship of rest length 400 m has speed 0.8c with respect to certain reference frame. A small meteorite is at rest with respect to this frame. Calculate the time taken by the spaceship to pass by the meteorite as measured by an observer (i) from the meteorite and (ii) from the spaceship. 2+2

    (d) State the relativistic relation between total energy and linear momentum of a particle of rest mass m_0. 1

16. (a) Given that the vector equation of motion of a rocket ejecting fuel at a constant velocity $\vec{u}$ and constant rate $\alpha = -\frac{dm}{dt}$ is :

$$\frac{d\vec{v}}{dt} - \frac{dm}{dt}\vec{u} = \vec{F},$$

[Turn Over]

where $\vec{v}$ is its instantaneous velocity with respect to ground and $\vec{F}$ is the gravitational force.

Find the condition of its soft landing along a vertical line if it starts from rest. 3

(b) Prove the relation $\vec{L} = \vec{L}_0 + \vec{L}'$ for a system of particles, where $\vec{L}$ and $\vec{L}'$ are the angular momenta of the system of particles with respect to the laboratory frame and the center of mass frame respectively and $\vec{L}_0$ is the angular momentum of the system of particles with respect to the laboratory frame if its total mass is assumed to be conserved at its centre of mass. 4

(c) For a forced harmonic oscillator given that : natural frequency $\omega_0 = \pi S^{-1}$ and damping force per unit mass per unit velocity = 1.5π *dyne* g^{-1} $(cm/s)^{-1}$. Calculate the half power frequencies and sharpness of resonance. 3

2019

Part-II

Chemistry

(Honours)

Paper – IV

Full Marks - 45

Time - 2 Hours

The questions are of equal value for any group / half.
The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answers wherever necessary.

Group – A

Answer any **one** question : 15 × 1

1. (a) For weak electrolytes, the equivalent conductance, Δ increases with dilution indefinitely and hence no equivalent conductance at infinite dilution can be defined for such electrolytes. Comment on this statement. 3

(b) How does the de Broglie hypothesis lead to one important postulate made by Bohr in his theory of the hydrogen atom? 3

(c) Find the simplest formula of a soild containing A and B atoms in a cubic arrangement in which A occupies corner and B the centre of faces of the unit cell. If the edge length is 5.0 Å, estimate the density of the solid assuming the atomic weights of A and B to be 60 and 90, respectively. 3

d) KCl or NH_4No_3 is preferred to construct a salt bridge. Explain. 3

e) When 2 grams of a non-volatile hydrocarbon containing 94.4% carbon is dissolved in 100 gm of benzene, the vapour pressure of benzene at 20°C in lowered from 74.66 mm of Hg to 74.01 mm of Hg. Calculate the molecular formula of the hydrocarbon. 3

2. (a) Show that the function,

$f(y) = (16y^4 - 48y^2 + 12)e^{-y^2/2}$ is an eigenfunction of the operator $B = -(d^2/dy^2) + y^2$, and calculate the eigenvalue. 3

(b) Why is camphor more suitable than water as a solvent in the determination of molecular weights of organic substances by the depression of freezing point measurement? 3

(c) Does the equilibrium constant of a reaction depend upon (i) the standard states chosen for the reactants and the products, and (ii) the stoichiometric representation of the reaction? Justify your answer. 3

d) What will be the pH of a solution obtained by mixing 10 ml of 0.2 (N)KOH with 20 ml of 0.1 (N)CH_3COOH? Given K_a(for CH_3CO_2H)=2×10^{-5}. 3

e) The resistance of a conductivity cell was found to be 700 ohms and 800 ohms when filled with 0.01(N) KCl and 0.01(N)$AgNO_3$ solutions respectively. The equivalent conductance of KCl is 150 $ohm^{-1}cm^2$. Find the equivalent conductance of $AgNO_3$. 3

Group – B

Answer *any Two* questions from the following : 10 × 2

3. (a) Show that for a particle confined in a three-dimensional box the degeneracy of the energy states increases with an increase in the symmetry of the system. 2½

(b) The plot of $\ell n k_p$ versus I/T will be linear if $\Delta cp=0$. Justify / Criticize the statement. 2½

(c) Show that : $(\partial H/\partial ni)_{s,p,nj(j\neq i)} = (\partial \upsilon/\partial ni)_{s,p,nj(j\neq i)}$ 2½

(d) Calculate the mean ionic activity coefficient of an aqueous solution of 0.001(M) $K_3[Fe(CN)_6]$ at 25°C. Given the Debye-Hückel constant for water at 25°C, A = 0.509. 2½

4. (a) From the expression for the chemical potential, μi, of the i^{th} component in an ideal gas mixture at constant temperature and pressure, obtain the relation $\Delta G° = -RT\ \ell nK_p$ for the equilibrium

$$\alpha A(g)+\beta B(g) = \gamma C(g)+\delta D(g)$$ 2½

(b) Consider a particle in a one-dimensional box with walls at x = –a and x = a, where the state function is given by $\psi(x) = A(x^2 - a^2)$. Determine the expectation value of the particle's position and comment on your result. 2½

(c) Construct a reversible electrochemical cell in which the following overall reaction takes place :

$$\frac{1}{2}H_2\,(g, 1atm + AgCl(s) \rightleftharpoons Ag(s) + HCl)(a = 0.1$$ 2½

(d) A substance, A_xB_y is found to crystallize in a FCC lattice with A at each corner, and B at each face. What will be the formula for the compound? 2½

5. (a) Defind ionic mobility, and mention its unit. State (without deniation) its relationship with the ion conductance. 2½

(b) For AgI, the solubility product, $K_{sp}=8.7\times10^{-17}$ at 25°C. What will be the potential of the Ag^+/Ag electrode in a saturated solution of AgI at 25°C? 2½

(c) Show that the wavefunction $\psi(x,t)=e^{i(px-Et)/\hbar}$ is a solution of the one-dimensional time-dependent schrodinger equation. 2½

(d) For the reaction, $A_2(g) \rightleftharpoons 2A(g)$, the relation Kp = Kc(RT) implies that the SI unit of Kp/Kc is joule $mole^{-1}$. Justify/Criticize the statement. 2½

6. (a) Which of the following quantities must be same for $CaCl_2$(aq) and NaCl(aq) at the same temperature? $\lambda^{\circ}_{cl^-}$, $t^{\circ}_{cl^-}$ and $u^{\circ}_{cl^-}$ Give reasons. 2½

(b) For the reaction $AB(g) \rightleftharpoons A(g)+B(g)$, $kp=8.0\times10^{-9}$ at 100°C. The forward reaction would be spontaneous under the following arbitralily chosen parial pressures : $p_{AB(g)}=0.1$ atm, $p_{A(g)}=p_{B(g)}=2\times10^{-5}$ atm. Justify/Criticize the statement. 2½

(c) A solution containing 0.011 kg of barium nitrate in 100 g of water boils to 100.46°C. Calculate the degree of ionization of the salt. Given that the K_b for 100 g of water is 5.2 K kg mole^{-1}. 2½

d) A linear operator A is such that, $\hat{A}\varnothing = a\varnothing$. Find out the value of $e\hat{A}\varnothing$ 2½

Group – C

Answer *any* **five** questions : 5 × 2

7. (a) For the solution of a solute in a non-polar solvent at a particular concentration $\Delta Tb/Tb$ is independent of the nature of the solvent. Justify.

(b) Classify the following operators into linear and non-linear : (i) $\int dx$ (ii) $x^2(d^2/dx^2)$

(c) The solubility product of PbI_2 in water at constant temperature always decreases in the presence of KI. Justify/Criticize the statement.

(d) Amide ion in liquid ammonia has an abnormally high transport number. Why?

(e) What will happen to the equilibrium $PCl_5(g) \rightleftharpoons PCl_3(g)+Cl_2(g)$ if neon gas in introduced into the system at contant temperature and pressure?

(f) White tin (S=7.29 g/cm^3) crystallizes in a tetragonal system with a=b=582 pm and c=317.5 pm.

g) Construct an electrochemical cell in which the following reaction takes place :

$2Ag(s)+Cl_2(g) \rightleftharpoons 2AgCl(s)$.

h) The potential of an electrochemical cell in an intensive property. Justify/Criticize the statement.

NEW

Part–III 3-Tier

2019

CHEMISTRY

(Honours)

PAPER—VI

Full Marks : 90

Time : 4 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Use separate scripts for Group-A and Group-B

Group—A

(Organic)

Group—A(a)

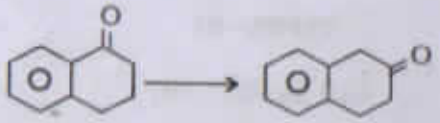
Answer any *one* question. 1×15

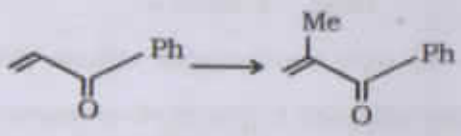
1. (a) Compare the λ_{max} value of s-cis and s-trans-1,3-butadiene and explain. 2

(b) What happens when the following compound is heated with piperidine in DMF ? 2

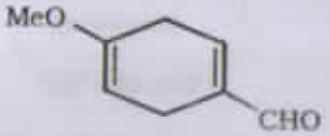
CH_2-OCONH-CH(CH_3)-COOOH

(c) How will you convert ? 2×2

(i) 

(ii) 

(d) Write down the two sets of diene and dienophite of the following adduct. Which set is more appropriate and why ? 1+1+1



(e) How will you prepare 4-Nitropyridine from pyridine ? 2

(f) Explain the "Anomeric effect with the help of M.O. theory. 2

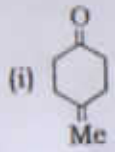
2. (a) A heptapetide on reaction with DNFB followed by hydrolysis produces N-DNP valine. The hydrolysis of peptide by carboxypeptidase enzyme releases glutamic acid. The partial hydrolysis product of peptide by 6(N) HCl are as follows :

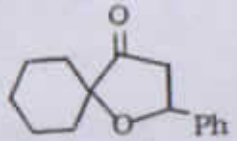
(i) Pro-Leu-Val (ii) Ala-Tyr-Pro

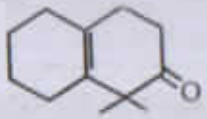
(iii) Leu-Val-Glu (iv) Val-glu.

Identify the sequence of amino acids in the heptapeptide and explain. 1+1+1+1

(b) Write down the retro synthetic path and forward synthesis of the following compounds. (any *two*) 3×2

(i) 

(ii) 

(iii) 

(iv) 

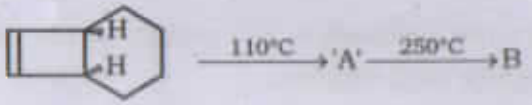
(c) Write down the basic principle of Sorenson's formal titration of amino acids. 2

(d) Write down the Skuarp synthesis of quinoline. 3

Group—A(b)

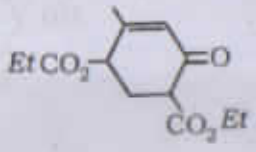
Answer any *two* questions. 2×10

3. (a) Predict the product with explanation 2+1



(b) How will you prove the ring size of glucose and fructose component present in cane sugar. 3

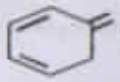
(c) Write retro synthesis and hence synthesis of 2



(d) Why furan-2 aldehyde undergoes Cannizaro reaction but pyrole-2-aldehyde does not ? 2

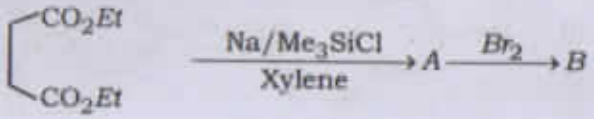
4. (a) Write a mechanism of colour reactions of amino acid with ninhydrine. Why proline behave differently ? 2+1

(b) Explain

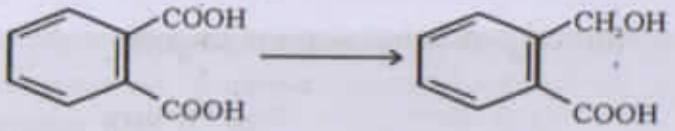
(i)  is stable at ordinary temperature. 1

(ii) Whether there will be any change in stretching wave number of O—H group of phenol when solvent is changed from carbon tetrachloride to benzene. Explain. 1

(c) Predict the products with mechanism 2+1



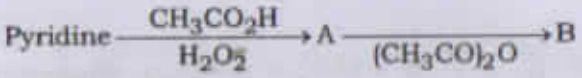
(d) Convert



2

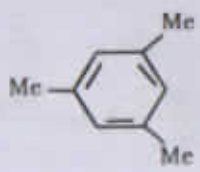
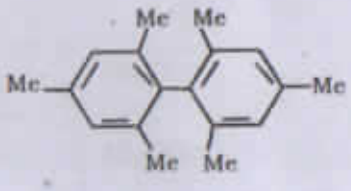
5. (a) Write mechanism of Fisher indole synthesis. 2½

(b) Predict the products with mechanism 3



(c) Convert : D-Glucose ⟶ D-3-0-Methyl Glucose 2

(d) Distinguish the following pair of compounds as directed

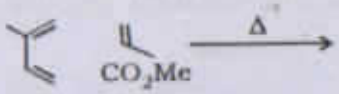
(i)  and 

[by UV spectra] 1

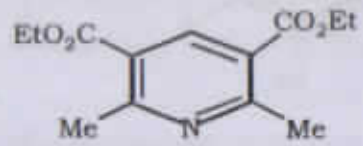
(ii) $CH_3—O—CH_3$ and CH_3CH_2OH

[by ^1H NMR spectra] 1½

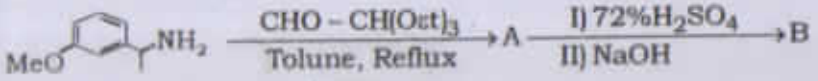
6. (a) Predict the products indicating minor and major using FMO approach for the reaction : 3



(b) Write retrosynthetic analysis and synthesis of 1½+1½



(c) Predict the product : 2

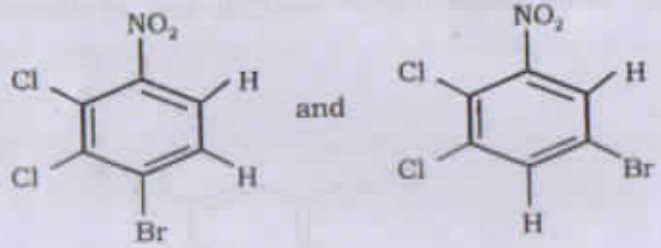


(d) How will protect amino group of an amino acid during dipeptide synthesis. 2

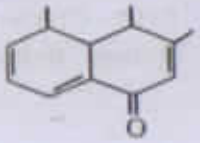
Group—A(c)

Answer any *five* questions. 5×2

7. (a) Define coupling constant (J). Use the value of J to distinguish between 1+1

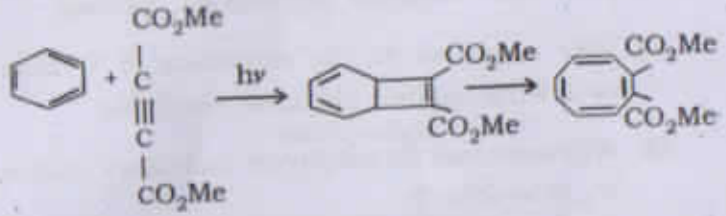


(b) Using Woodward's rule calculate λ max value of 2



(c) Mention one method for detection of c-terminal of a polypeptide 2

(d) Explain the formation of the products in the following reaction : 2



(e) Indole undergoes electrophilic substitution at C-3 but pyrorole at C-2. Explain. 2

(f) What is meant by bathochromic shift ? Why UV spectra of aniline is identical with benzene in acid medium ? 1+1

(g) Convert : D – glucose ⟶ D – Manose 2

Group—B

(Inorganic)

Answer any *one* question. 1×15

8. (a) A square planar arrangement of ligands can be formally derived from an octanedral array by removal

of two transligands. Explain by showing crystal field splitting diagrams. 2

(b) Both $[Ni(CN)_4]^{2-}$ and $[Ni(CO)_4]$ are diamagnetic but they have different Geometries. Explain. 2

(c) Give a scheme for the extraction of 'V' from its ore and write related chemical reactions. 3

(d) Why are small Fe-porphyrin complexes unable to bind O_2 reversible ? 2

(e) Give an outline of a possible mechanism for the Ziegler-Natta polymerization of ethene. 3

(f) Give two synthetic routes for preparations of ferrocene. 2

9. (a) Predict which of the complexes $[V(CO)_6]^-$, $Cr(CO)_6$ and $[Mn(CO)_6]^+$ has shortest C—O bond ? 2

(b) Discuss the quadruple bonding in $[ReCl_8]^{2-}$. 2

(c) What are photosystem I and II ? Explain their role in photosynthesis using "Z-diagram". 4

(d) Sketch different bonding modes of nitrosyl ligand. 2

(e) The isoelectronic ions VO_4^{3-}, CrO_4^{2-} and MnO_4^- all have intense charge transfer transition where MnO_4^- having absorption at the longest wavelength. Suggest a reasons for this trend. 2

(f) Comment on the observation that octahedral Ni(II) complexes have magnetic moments in the range $2.9-3.4\,\mu_B$, tetrahedral Ni(II) complexes have moments upto $\approx 4.1\mu_B$ and square planar Ni(II) complexes are diamagnetic. 3

Group—B(b)

Answer any *two* questions. 2×10

10. (a) For $[Ti(OH_2)_6]^{3+}$, a value of Δ_{oct} can be determinal directly from λ_{max} in the electronic spectrum. Why is this not possible for $[V(OH_2)_6]^{3+}$, and for most other octahedral ions ? 2

(b) Addition of sodium ethanoate to aqueous solution of Cr(II) gives a red diamagnetic product. Draw the structure of the product noting any features of interest. 3

(c) A standard five-day BOD test is run using a mix consisting of four parts distilled water and one part waste water (no seed). The initial DO of the mixture is 9.0 mg/L and the DO after five days is determined to be 1.0 mg/L. What is BOD_5. 2

(d) Classify the following ligands as σ-donot, Π-donor or Π-acceptor F^-, CO and NH_3. 3

11. (a) Comment with reasoning, on how you expect the trend in radii for the lanthanoid M^{3+} ions between La^{3+} and Lu^{3+} to vary. 2

(b) Why is the change from deoxyhaemoglobin to the oxy-Form accompanied by a decrease in the observed magnetic moment ? 2

(c) In $[Fe(CN)_6]^{3-}$, does the CN^- ligand act as a Π donor or a Π acceptor legand ? Explain how the ligand properties lead to $(Fe(CN)_6]^{3-}$ being low-spin. 2

(d) Show the varjation of ionic radii of M^{2+} ion of the 3d-block elements. 3

(e) Show that $[Mn(CO)_5]^-$ obeys the 18-electron rule.

12. (a) Write a note on metal ion transportation across the biological membrane.

(b) The Racah parameter B is 460 cm^{-1} in $[Co(CN)_6]^{3-}$ and 615 cm^{-1} in $[CO(NH_3)_6]^{3+}$. Consider the nature

of bonding with the two ligands and explain the difference in nephelauxetic effect. 2

(c) What metal indicator is used for the complexomeric estimation of Ca^{2+} by EDTA titration ? Explain its indicator action. 3

(d) Complete the following reaction sequence with explanation and identify A and B

$$[Pt[NH_3]_4]^{2+} \xrightarrow{HCl} A \xrightarrow{HCl} B$$ 2

13. (a) Explain why $[FeF_6]^{3-}$ is colourless whereas $[CoF_6]^{3-}$ is coloured but exhibits only a single band in the visible. 2

(b) State the reaction of ferrocene with 2

(i) N_2O_4 and

(ii) n-BuLi

(c) The high-spin complex $Cr(H_2O)_6]^{2+}$ is labile, but low-spin complex $[Cr(CN)_6]^{4-}$ is inert. Explain. 3

(d) An octahedral d^8 complex show d-d absorption bands at 10739, 17489 and 28217 cm^{-1}. Assign the bands from orgel diagram and calculate $10D_q$. 3

Group—B(c)

Answer any *five* questions : 2×5

14. (a) What is Z-R reagent ? Explain the role of this solution in the permanganometric titration of Fe^{2+}.

(b) 'The magnetic moment of $VO(acac)_2$ is 1.7 BM'. Discuss.

(c) Discuss the role of Zn^{2+} in the active site of the carbonic anhydrase.

(d) Explain the structure for the simplest dinuclear carbonyl compound of cobalt.

(e) Draw a polarogram and identify different parts.

(f) What happens when Co(II) acetate is treated with ammonium thiocyanate in presence of mercuric chloride in aqueous solution.

(g) The spectrum of $[Ti(H_2O)_6]^{3+}$ shows a broad peak with a shoulder. Explain.

(h) The NO stretching frequency in $[Fe(CN)_5NO]^{2-}$ and $[Fe(H_2O)_5NO]^{2+}$ appears at 1939 cm^{-1} and 1745 cm^{-1} respectively. Comment.

(i) How many isomers are possible for $[Co^{II}(bpy)_2(NCS)Cl]$? Give reasons for your answer.

———

Where N is a constant. (i) Determine the number and location of node(s) in 2s wave function. (ii) Write down the expression of radial distribution function of the 2s electron and sketch the radial distribution curve.

(c) The standard e.m.f. of the cell

$$Pt(S)|H_2(g)|HBr(aq)|AgBr(S)|Ag(S)$$

was measured over a range of temperature, and the data were fitted to the polynomial

$$E^{\circ}(V) = 0.07131 - 4.99\times10^{-4}\left[T(K) - 298\right]$$

$$-3.45\times10^{-6}\left[T(K) - 298\right]^2.$$

Determine the standard Gibbs free energy, enthalpy and entropy at 298 K. 2+(1+3)+4

2019

B.Sc.

4th Semester Examination

CHEMISTRY (Honours)

Paper - C8T

Full Marks : 40 Time : 2 Hours

The figures in the margin indicate full marks. Candidates are required to give their answers in their own words as far as practicable.

Group - A

Answer any *five* questions from the following. 2×5=10

1. (a) When are elevation of freezing point and depression of boiling point observed ? Explain with examples.

   (b) Why is p-dichlorobenzene non-polar but p-dihydroxybenzene is polar ?

[Turn Over]

(c) Write down the number of components, phases and degrees of freedom of the following equilibrium

$$NH_3(g)+HCl(g) \rightleftharpoons NH_4Cl(S)$$

(d) Construct a cell for the following reaction

$$HCl+NaOH=NaCl+H_2O.$$

(e) I_2 usually sublimes. Why ? How can it be melted ?

(f) Calculate the ionic strength of a solution obtained by mixing equal volumes of 0.01 (M) $NaCl$ and 0.02 (M) $AlCl_3$.

(g) Discuss the effect of dielectric constant on activity coefficient.

(h) Show that $\frac{\partial(E^\circ/T)}{\partial(1/T)}=-\frac{\Delta H^\circ}{nF}$.

Group - B

Answer any *four* questions from the following.

2. (a) Derive thermodynamically a relation between the elevation of boiling point and molality of a dilute solution of a non-volatile and non-electrolyte solute.

(b) How can you form a chemical cell without transference without using a salt bridge ? 4+1

3. (a) Drive Gibb's phase rule.

(b) Can you use quinhydrone electrodes above pH = 8 ? Explain. 4+1

4. (a) For the following cell with transference,

$$Ag\,|\,AgCl(s),\ HCl(a_1)\,|\,HCl(a_2),$$

$$AgCl(s)\,|\,Ag$$

derive an expression for liquid junction potential.

(b) Write the expression for thickness of ionic atmosphere and explain the terms involved in this expression. 4+1

5. (a) Derive Duhem-Margules equation.

(b) Calculate $a_\pm$, $c_\pm$ and $f_\pm$ of $CaCl_2$ in a 0.01 (M) solution. Given $f_+=0.5$ and $f_-=0.8$. 3+2

6. (a) Show that $\left[\widehat{L^2}, \widehat{L_z}\right] = 0$.

What does this result signify ?

(b) Using classical mechanics, show that the total energy of a rigid rotator is $E = \frac{1}{2} I\omega^2$ where I is the moment of inertia and ω is the angular velocity. 3+2

7. (a) Considering H_2 as an example, draw, a comparison between Valence Bond and Molecular Orbital model.

(b) Calculate the thickness of ionic atmosphere for a 0.01 (M) $MgCl_2$ solution at 298 K. Given that the thickness of the ionic atmosphere for a 0.1 (M) $NaCl$ solution is 0.96 nm at 298 K. 3+2

Group - C

Answer any *one* question from the following.

8. (a) The normalised radial wave function of hydrogen atom is

$$R_{10}(r) = 2\left(\frac{1}{a_0^{3/2}}\right).e^{-r/a_0}$$

Where a_0 is a constant. Calculate $\langle r \rangle$.

Given, $\int_0^\infty r^n.e^{-ar}\,dr = \frac{n!}{a^{n+1}}$, $n > 1$, $a > 0$.

(b) Draw the phase diagram for water. Apply Gibb's phase rule and Clapeyron equation to explain the diagram.

(c) Discuss the physico-chemical principle involved in the measurement of pH of an aqueous solution by using a glass electrode. 3+4+3

9. (a) Plot R_{10}^2 and R_{20}^2 as a function of distance (r) of the electron from the nucleus for the hydrogen atom. What discrepancies are observed in these plots ?

(b) What is radial distribution function ? The radial wave function of 2s orbital of a hydrogen atom is given by

$$R_{20} = N\left(2 - \frac{r}{a_0}\right).e^{-r/2a_0}$$

[Turn Over]

(b) Describe the function of first pass of assembler. 4

12. Describe the set associative mapping of cache memory in details of tag,word etc. 8

GROUP – C

Answer any **five** quesations : 4×5

13. Write down the steps of CALL instruction of 8085 MP. 4
14. Write down the steps of micro operations for fetch cycle. 4
15. Write a short note on 'Relocating Loader'. 4
16. Why microprocessor is so called micro ? Justify. 4
17. Write down the six control signals of 8255A chip. 4
18. What is the difference between 'compile and go loader ' and 'assembles' ? 4
19. What is the function of the following instructions: SHLD 2400H, RAL. 4
20. Design a 4 bit carry look - ahead adder. 4

[Internal Assesment : 10]

2019

Part – II

COMPUTER SCIENCE

(Honours)

Paper – IV

Full Marks – 90

Time : 4 Hours

The questions are of equal value for any group / half.
The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answers wherever necessary.

GROUP – A

Answer any **two** of the following questions : 15×2

1. (a) Draw the timing diagram for the instruction MVI M,24H. 6

   (b) Write down the task of READY, HOLD & HLDA pin of 8085 microprocessor. 6

   (c) What is co-processor ? 3

2. (a) Define T-state, Machine cycle and instruction cycle. 6

(b) Convert the following instruction :

$$X = \frac{A+B}{C-(D\times E)}$$

into zero address instruction ,one address and two address instruction. 6

(c) What is the difference between combinational ALU and sequencial ALU. 3

3. (a) Write a delay routine for 1 sec delay. 5

(b) What is MOT (Machine - OP Table) and POT(Pseudo Table) ? 4

(c) What is loader ? What are the furnctions of loader ? 2+4

4. (a) What are the different cache write operations ? 5

(b) Write down the pass 1 algorithm for macro processor ? 5

(c) Write the wilke's micro programmed control unit ? 5

GROUP – B

Answer any **five** questions : 8×5

5. (a) Define seek time and latency time. 2+2

(b) What is tri-state buffer ? What is its application ? 2+2

6. (a) What are the differences between RISC and CISC architecture ? 4

(b) What is bus arbitration ? 2

(c) What is PSW ? 2

7. (a) What is the difference between Hardwired and microprogrammed control unit ? 4

(b) Write an assembly langusage program to trans fer 10 bytes of date stored from d200H to d209 H into C400H to C409H. 4

8. Write an assembly language program to multiply 09H× 24H 8

9. Design a 8085 based microprocessor based system to interface memory of two 2k RAM and four 1k ROM and specify each block of memory. 8

10. (a) Write down the control word for BSR mode and I/O mode of 8255A. 4

(b) Design the separate read write instruction signal for memory and I/O ? 4

11. (a) What is the difference between linkage editor and linking loader ? 4

19. Differentiate between physical and logical data independence. 4

20. How applet differs from application in Java ? 4

[Internal Assessment : 10 Marks]

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NEW

Part-III 3-Tier

2019

COMPUTER SCIENCE

(Honours)

PAPER—VI

Full Marks : 100

Time : 4 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group—A

Answer any *two* questions.

1. (a) What is object oriented programming ? How it is different from procedure oriented programing ?

(b) Distinguish between object and class. In what order are the class constructors called when a derived class object is created ? Explain.

(c) Write a class ACCOUNT that represents your bank account and then use it. The class should allow you to deposit money, withdraw money, calculate interest, and send you a message if money is not sufficient in the account. Use constructor to provide initial amount in the account. (2+3)+(2+3)+5

2. (a) Discuss the working of 2D Scaling with respect to origin and with respect to fixed (pivot) point with suitable example.

(b) Prove that two successive translations are additive.

(c) Apply midpoint circle algorithm to find the pixel values of the circle whose radius $r = 4$ and centre of the circle = (0, 0). 5+5+5

3. (a) Construct minimum state DFA's for the following regular expression

$$(a/b)^* a (a/b)$$ 8

(b) What is Multi-tape turing Machine ? 3

(c) Draw the parse tree for the input "$y+++y++$". 4

4. (a) Write down the algorithm to check if a decomposition is loss-less or not. Given $R(A, B, C, D, E)$ with FD's

$$F = \{AB \rightarrow CD, A \rightarrow E, C \rightarrow D\}.$$

Verify the decomposition of R into $R_1(A,B,C)$, $R_2(B,C,D)$, $R_3(C,D,E)$ is loss-less or not. 4+4

(b) Draw an E—R diagram of the University admission system as per following rules :

(i) There are three faculties Arts, Science and Commerce.

(ii) Each faculties conducts UG Courses and PG Courses.

(iii) There are various subjects in each UG and PG courses.

(iv) The University prepares a merit list of students according to their marks in each subject categories. Clearly mention the generalization, specialization and aggregation. Find entities and show the relationship clearly. 7

Group—B

Answer any *five* questions.

5. (a) Explain Primitive type conversion and casting with examples.

(b) How garbage collector plays its role ? Explain.

(c) Differentiate between thread and process ? How a thread is created ? Discuss. 2+2+(2+2)

6. (a) Write difference between FA and PDA.

(b) Design a DFA corresponding to regular expression

$(a + b)^*aba(a + b)^*$ 3+5

7. (a) Explain the following : (i) Key constraints (ii) Integrity constraints.

(b) Differentiate between where clause and group by clause. (2½+2½)+3

8. (a) Define translation and scaling with an example.

(b) Determine the form of the transformation matrix for a reflection about an arbitrary line with equation $y = mx + b$. 4+4

9. (a) Explain indirect Triple representations.

(b) Translate the $Y = (C + D) * -a / b$ expression into quadruple, Triple and Indirect Triple representation. 2+(2+2+2)

10. Derive window port to viewport transformation matrix in clipping. 8

11. (a) Define 3NF and BCNF. 2+2

(b) What is normalization ? Why do we use it ? 2+2

12. (a) Difference between method overloading and method overriding. 3

(b) What is the difference between an interface and abstract class ? 3

(c) What is wrapper class ? 2

Group—C

Answer any *five* questions. 5×4

13. What is JVM ? Give importance of JVM in java language. 1+3

14. Explain about the super keyword with examples. What is thread synchronization ? 2+2

15. Write regular expression to denote a language L, which accepts all the strings which begin or end with either 00 or 11. 4

16. Describe boundary fill algorithm for polygon with suitable example. 4

17. What is the difference between an interface and an abstract class ? 4

18. Explain the difference between raster scan and vector scan technology. 4

(b) Describe the function of first pass of assembler. 4

12. Describe the set associative mapping of cache memory in details of tag,word etc. 8

GROUP – C

Answer any **five** quesations : 4×5

13. Write down the steps of CALL instruction of 8085 MP. 4
14. Write down the steps of micro operations for fetch cycle. 4
15. Write a short note on 'Relocating Loader'. 4
16. Why microprocessor is so called micro ? Justify. 4
17. Write down the six control signals of 8255A chip. 4
18. What is the difference between 'compile and go loader' and 'assembles' ? 4
19. What is the function of the following instructions: SHLD 2400H, RAL. 4
20. Design a 4 bit carry look - ahead adder. 4

[Internal Assesment : 10]

2019

Part – II

COMPUTER SCIENCE

(Honours)

Paper – IV

Full Marks – 90

Time : 4 Hours

The questions are of equal value for any group / half.
The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answers wherever necessary.

GROUP – A

Answer any **two** of the following questions : 15×2

1. (a) Draw the timing diagram for the instruction MVI M,24H. 6

   (b) Write down the task of READY, HOLD & HLDA pin of 8085 microprocessor. 6

   (c) What is co-processor ? 3

P.T.O.

2. (a) Define T-state, Machine cycle and instruction cycle. 6

(b) Convert the following instruction :

$$X = \frac{A+B}{C-(D\times E)}$$

into zero address instruction ,one address and two address instruction. 6

(c) What is the difference between combinational ALU and sequencial ALU. 3

3. (a) Write a delay routine for 1 sec delay. 5

(b) What is MOT (Machine - OP Table) and POT(Pseudo Table) ? 4

(c) What is loader ? What are the furnctions of loader ? 2+4

4. (a) What are the different cache write operations ? 5

(b) Write down the pass 1 algorithm for macro processor ? 5

(c) Write the wilke's micro programmed control unit ? 5

GROUP – B

Answer any **five** questions : 8×5

5. (a) Define seek time and latency time. 2+2

(b) What is tri-state buffer ? What is its application ? 2+2

6. (a) What are the differences between RISC and CISC architecture ? 4

(b) What is bus arbitration ? 2

(c) What is PSW ? 2

7. (a) What is the difference between Hardwired and microprogrammed control unit ? 4

(b) Write an assembly langusage program to trans fer 10 bytes of date stored from d200H to d209 H into C400H to C409H. 4

8. Write an assembly language program to multiply 09H× 24H 8

9. Design a 8085 based microprocessor based system to interface memory of two 2k RAM and four 1k ROM and specify each block of memory. 8

10. (a) Write down the control word for BSR mode and I/O mode of 8255A. 4

(b) Design the separate read write instruction signal for memory and I/O ? 4

11. (a) What is the difference between linkage editor and linking loader ? 4

2019

B.Sc. (Hons)

4th Semester Examination

COMPUTER SCIENCE

Paper - C8T

(Design & Analysis of Algorithm)

Full Marks : 40 Time : 2 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group-A

1. Answer any *five* questions : 5×2=10

(a) Write down the properties of an algorithm.

(b) What is time complexity and space complexity?

(c) List three traversal algorithms in a binary tree.

(d) State general principle of greedy algorithm.

(e) What are BFS and DFS ?

[Turn Over]

(f) What is the time complexity of best, worst, average case of Quick sort algorithm ?

(g) What is called divide-and-conquer strategy ?

(h) Explain concept of recursive algorithm technique.

Group - B

2. Answer any *four* of the following : 4×5=20

(a) Briefly explain the concept of Big 'oh' notation, omega notation and theta notations.

(b) Given two sorted sub-array A[p...q] and B[q + 1, ..., r]. Write an algorithm to merge the two sorted sub-arrays into one sorted array C[p,...,r].

(c) How will you solve a knapsack problem using dynamic programming ? Explain briefly.

(d) Illustrate the tracing of quick sort algorithm for the following set of numbers : 96, 25, 41, 54, 63, 39, 78, 16.

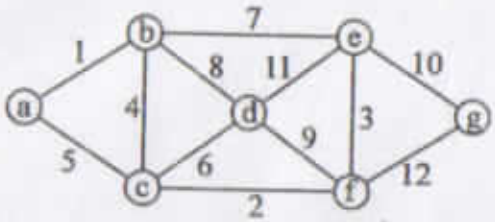
(e) Write down the pseudo code for KMP algorithm.

(f) Calculate the time complexity of Mergesort algorithm.

Group - C

3. Answer any *one* questions : 1×10

(a) (i) Write Prim's algorithm to find a minimum east spanning tree (MCST) of a graph. Find MCST for the following graph using Prim's algorithm. Consider 'a' as the starting vertex.



(b) (i) Write down the matrix chain multiplication algorithm using dynamic programming. 8

(ii) Calculate the time complexity of binary search algorithm. 2

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6. Answer any *three* questions from the following : 3×2

(a) Mention the properties of correlation.

(b) Mention various components of time series.

(c) Distinguish between correlation coefficient and regression coefficient.

(d) If $b_{yx} = -0.5$ and $b_{xy} = -0.25$, find the value of r_{xy}.

(e) What is Pie-chart ?

[Internal Assessment — 5 Marks]

2019

Part–III

COST ACCOUNTING AND STATISTICS

(Honours in Marketing Management)

PAPER—MH-6

Full Marks : 100

Time : 4 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Group—A

1. Answer any *one* question : 1×15

(a) From the following information, prepare a cost sheet showing prime cost, works cost, cost of goods sold and profit :

	2018 on January 1 Rs.	2018 On June 30 Rs.
Cost of raw materials	30,000	25,000
Cost of W.I.P	12,000	15,000
Cost of stock of finished goods	60,000	55,000

Transactions during six months are :

Purchases of raw materials	4,50,000
Wages paid	2,30,000
Factory overheads	92,000
Administration overheads	30,000
Selling distribution overheads	20,000
Sales	9,00,000

4+4+4+3

(b) What is Cost Accounting? What are its important objectives? Distinguish between Cost Accounting and Financial Accounting. 3+6+6

(Continued)

(c) The following is an extract of the record of receipt and issues of sulphur in a chemical factory during December, 2018 :

Dec 1 : Opening balance 500 tons @ Rs. 200

8 : Issued 250 tons

13 : Received from supplier 200 tons @ Rs. 190

16 : Issued 180 tons

20 : Received from supplier 240 tons @ Rs. 130

24 : Issued 300 tons

25 : Received from supplier 320 tons @ Rs. 180

28 : Issued 200 tons

29 : Received from department 30 tons @ Rs. 180

Issued are to be priced on FIFO principle. The stock varifier of the factory had found a shortage of 10 tons on 22 December and left a note accordingly.

Draw up a Store Ledger. 15

(Turn Over)

2. Answer any *three* questions : 3×8

(a) What is ABC analysis of stores control ?

(b) What is normal loss ? How is it treated in cost accounts ? 2+6

(c) Discuss the treatment of under-absorbed and over-absorbed factory overheads in cost accounting.

(d) The annual requirement of an item is 12000 units each costing Rs. 6. Every order costs is Rs. 200 and inventory carrying charges are 20% of the average inventory per annuam.

Find out Economic Order Quantity and total inventory cost.

(e) From the following details calculate the total earnings of a worker and effective hourly rate of labour wages where bonus is paid under :

(i) The Halsey (50%) plan

(ii) The Rowan Plan :

Basic rate of wages per hour	Rs. 36
Time allowed for the job	16 hours
Time actually taken	12 hours

3. Write short notes (any *three*) : 3×2

(a) Cost unit.

(b) By-products.

(c) Opportunity cost.

(d) What is cost sheet ?

(e) What is semi-variable cost ?

[Internal Assessment — 5 Marks]

Group—B

4. Answer any *one* question : 1×15

(a) For a set of 10 observations, the AM and the CV are 40 and 40% respectively. If one observation equal to 50 is left out, what will be the value of AM and CV for the remaining 9 observations in the set ? 7+8

(b) Fit a straight line trend equation by the method of least squares from the following profit figures of Palco Traders. Also estimate the trend value for the year 2020.

Year (x) :	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Profit (y) : ('000)	65	80	84	75	77	71	76	74	70	68

(c) (i) Two lines of regression are given by $x + 2y = 5$ and $2x + 3y = 8$. Calculate the value of $\bar{x}$, $\bar{y}$ and correlation coefficient between x and y.

(ii) What are the important properties of correlation coefficient ? 12+3

5. Answer any *three* questions : 3×8

(a) Mention various types of correlation using scatt(diagram.

(b) Explain the term skewness and its various types. 2+6

(c) Find SD from the following distribution :

Rupees	Frequency
0 and above	50
10 and above	44
20 and above	36
30 and above	24
40 and above	14
50 and above	6
60 and above	0

(d) Define primary data and secondary data. Define discrete variable and contineous variable. 4+4

(e) (i) The cost of living index number for a certain group goes up from 110 in 2011 to 220 in 2018 and the monthly salary of a worker belonging to this group is also raised from Rs. 22,000 in 2011 to Rs. 33,000 in 2018. Does the worker really gain ?

(ii) What is cost of Living Index ? 5+3

গ) উর্দ্ধপত্রের নিমিত্ত মজুতের মূল্য। ১৫

ঘ) নিম্নলিখিত বিবরণ হইতে (ক) মূল্যবায় (খ) কারখানার ব্যয় (গ) উৎপাদন ব্যয় (ঘ) বিক্রয়ের ব্যয় এবং (ঙ) 2019 সালের এপ্রিলমাসের মুনাফা দেখাইয়া পরিব্যয় তালিকা প্রস্তুত কর :

Direct Labour Cost Rs. 1,44,000 (150% of factory overhead),

Cost of goods sold Rs. 6,40,000

	April 1	April 30
	Rs	Rs
Raw Materials	56,000	64,000
Work-in-progress	12,000	16,000
Finished Goods	96,000	80,000

অন্যান্য তথ্য :

	Rs
Selling expenses	31,200
General and administration expenses	48,800
Sales for the month of April 2019	8,00,000

১৫

[অভ্যন্তরীণ মূল্যায়ণ — ১০ নম্বর]

2019

Part – II

COST ACCOUNTING

(Honours)

Paper – AH4

Full Marks – 100

Time : 4 Hours

figures in the right-hand margin indicate marks.

ndidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Group – A

Answer any **five** questions : 4×5

a) 'There is no need to install a costing system while financial records are to be compulsory maintained'—Justify the statement with reason. 4

b) Define 'Cost'. Is there any difference between 'cost' and 'expenses'? 2+2

c) Define 'direct material' and 'direct expenditure' and give two examples of each. 2+2

d) Define 'cost centre' and 'cost unit'. Give at least two examples of each. 2+2

e) What do you mean by 'Time keeping' and 'Time

booking'? 2+2

f) Mention the features of 'Process Costing'. 4

g) What do you mean by 'Composite Machine Hour Rate'? 4

h) What do you mean by 'Labour Efficiency Variance'? 4

i) Determine the break-even point and expected profit from sale of 6,00,000 units of a product whose selling price per unit is Re 0.50, variable cost Re 0.25 per unit and the total fixed cost is Rs 1,00,000. 2+2

j) What do you mean by 'Notional Cost'? 4

2. Answer any five questions : 8×5

a) Production section of a factory working on the Job Order System pay their workers under Rowan Premium Bonus Plan. Workers also get a dearness allowance of Rs 1200 per week of 48 hours.

A worker's basic wage is Rs 200 per day of 8 hours and his time sheet for a week is summarised below :

Job No.	Time Allowed	Time Taken
121	25 hrs	20 hrs.
203	30 hrs	20 hrs
Idle time (waiting)	—	8 hrs
		48 hrs

Calculate the gross weekly wages payable to the workman. 8

b) Distinguish between—

i) 'Cost of goods sold' and 'Cost of sales'; and

ii) 'Fixed Cost' and 'Variable Cost'. 4+4

c) Break-Even sales of AG Ltd during a certain period was Rs 2,50,000 and its P/V ratio was 20%. The net profit for the same period was Rs 30,000.

Find out –

i) Fixed cost of the company during that period;

ii) Actual sales, and

iii) Margin of safety. 3+3+2

d) SV enterprises manufactures a special product 'ZEE'. The following particulars were collected for the year 2018 :

i) Annual demand for the product 'ZEE' : 24,000 units.

ii) Cost of Placing an order : Rs 200.

iii) Annual carrying cost per unit : Rs 13.

iv) Normal usage : 100 units per week.

v) Maximum usage : 150 units per week.

vi) Re-order period : 4 to 6 weeks.

vii) Minimum usage : 50 units per week.

Compute from the above :

1. Re-order Quantity;
2. Re-order Stock Level;
3. Minimum Stock Level; and
4. Maximum Stock Level 2+2+2+2

e) Write short notes on (any two) :

i) Work-in-progress;

ii) Purpose of Cost Accounting;

iii) Sub-contract;

iv) Cost Allocation and Cost Apportionment. 4+4

f) A firm has purchased a machine to manufacture a new product, the cost and other data of which are given below :

Estimated Costs :

Direct Material Cost	:	Rs. 8000
Direct wages	:	15% of direct material cost.
Factory overhead	:	Rs. 2000
Administration overhead	:	Rs. 2400
Selling & distribution overhead	:	15% of sales
Estimated profit per unit	:	Re 0.17
Estimated annual sales	:	4000 units

Calculate the selling price per unit. 8

g) From the following particulars, prepare contract account :

	Rs.
Materials sent to site	1,80,000
Wages paid at site	90,000
Plant installed at site	2,40,000
Direct expenditure paid	28,500

Materials returned to stores	6,000
Establishment charges paid	12,000
Materials lost by fire	15,000
Work certified	3,60,000
Cost of work not yet certified	9,000
Wages accrued due on 31st March, 2019	6,000
Direct expenditure paid in advance on 31st March, 2019	1,500
Materials in hand on 31st Dec. 2019	12,000
Value of contract	5,40,000

The contract was started on and from 1st April, 2018. 90% of work certified is received in cash. Charge depreciation @ 15% on plant. 8

h) What are the objectives and characteristics of incentive wage system? 4+4

i) What are the basic features of contract costing? How is profit on incomplete contract calculated? 4+4

j) From the following particulars, calculate (i) Material cost variance (ii) Material price variance and (iii) Material usage variance :

i) Standard quantity of materials— for each unit of finished product — 50 kg

ii) Standard rate of material per kg — Rs. 2

iii) Materials purchased — 6000 kg

iv) Cost of Material Purchased — Rs.18000
v) Opening stock of Materials — 1000 kg
vi) Closing stock of Materials — 2000 kg
vii) Actual production — 160 units
2+3+3

3. Answer any **two** questions : 15×2

a) Compute Comprehensive Machine hour rate from the following data :

i) 13 machines in the department.

ii) Total machine cost of one machine to be depreciated — Rs 1,15,000; Life 10 years; Depreciation on straight line basis.

iii) Departmental area 35,000 square feet.

iv) Machine area 1,250 square feet.

v) Departmental Overhead (annual) :

Rent	Rs 25,000
Heat & Light	Rs 10,000
Supervision	Rs 65,000

vi) Annual cost of reserve materials for the machine — Rs 1500.

vii) Hours run on Production — 900 hrs

viii) Power cost Re 0.50 per hour of running time

ix) Labour (a) When setting & adjusting, full time attention.

(b) When machine is producing one man can look after machines.

x) Labour rate Rs 3 per hour. 15

b) Write short notes on : (any three)

i) Bin Card and Stores Ledger;

ii) Group Bonus;

iii) Cash Received and Retention Money;

iv) Marginal Cost;

v) Merit rating. 15

c) A certain product passes through two processes before it is transferred to finished stock. The following information is obtained for the month of March, 2019 :

Items	Process I	Process II	Finished stock
	Rs	Rs	Rs
Opening stock	20,000	24,000	60,000
Direct Materials	35,000	40,000	—
Direct wages	35,000	32,000	—
Factor overhead	28,000	12,000	—
Closing stock	10,000	12,000	30,000
Profit Percentage on transfer price (to the next process)	25%	20%	—
Inter Process Profit for opening stock	—	4,000	22,000

Stocks in process are valued at Prime cost and finished stock has been valued at the price at which it was received from process II. Sales for the period were Rs 5,00,000.

Prepare and Compute :

a) Process accounts showing profit element at each stage;

b) Actual realised profit; and

c) Stock valuation for Balance Sheet Purpose.

d) From the following particulars, prepare a statement showing—(a) Prime cost (b) works cost (c) cost of production (d) cost of sales and (e) profit for the month of April 2019 :

Direct Labour Cost Rs. 1,44,000 (150% of factory overhead),

Cost of goods sold Rs. 6,40,000

	April 1	April 30
	Rs	Rs
Raw Materials	56,000	64,000
Work-in-progress	12,000	16,000
Finished Goods	96,000	80,000
Other date :		Rs
Selling expenses		31,200
General and administration expenses		48,800
Sales for the month, April 2019		8,00,000

15

[Internal assessment–10 marks]

বঙ্গানুবাদ

দক্ষিণ প্রান্তস্থ সংখ্যাগুলি প্রশ্নমান নির্দেশক। পরীক্ষার্থীদের যথাসম্ভব নিজের ভাষায় উত্তর দেওয়া প্রয়োজন।

১। যে কোন পাঁচটি প্রশ্নের উত্তর দাও : ৪×৫

ক) 'যে ক্ষেত্রে বাধ্যতামূলক আর্থিক হিসাব লিপিবদ্ধ করা হয় সেইসব ক্ষেত্রে পরিব্যয় নির্ণয় পদ্ধতি প্রয়োগের প্রয়োজন হয় না'—যুক্তিসহ বিবৃতিটি যাচাই কর। ৪

খ) 'পরিব্যয়ের' সংজ্ঞা দাও। 'পরিব্যয়' ও 'খরচের' মধ্যে কোন পার্থক্য আছে কি? ২+২

গ) 'প্রত্যক্ষ মালপত্র' ও 'পরোক্ষ খরচের' সংজ্ঞা দাও এবং প্রত্যেকটির দুইটি করিয়া উদাহরণ দাও। ২+২

ঘ) 'পরিব্যয় কেন্দ্র' এবং 'পরিব্যয়-একক' এর সংজ্ঞা দাও। প্রত্যেকটির অন্ততঃপক্ষে দুইটি করিয়া উদাহরণ দাও। ২+২

ঙ) 'সময় লিপিবদ্ধকরণ' ও 'সময় আরোপ' বলিতে কি বোঝ? ২+২

চ) 'প্রক্রিয়া পরিব্যয়' এর বৈশিষ্ট্যগুলি উল্লেখ কর। ৪

ছ) 'সংমিশ্রিত যন্ত্র-ঘণ্টা হার' বলিতে কি বোঝ? ৪

জ) 'শ্রম-দক্ষতা ভেদমান' বলিতে কি বোঝ? ৪

ঝ) প্রতি একক পণ্যের বিক্রয়মূল্য 0.50 টাকা, পরিবর্তনশীল ব্যয় 0.25 টাকা এবং মোট স্থির ব্যয় 1,00,000 টাকা হলে 6,00,000 একক পণ্য বিক্রয়ে সমচ্ছেদ বিন্দু এবং মুনাফার পরিমাণ নির্ণয় কর। ২+২

ঞ) 'কাল্পনিক ব্যয়' বলিতে কি বোঝ? ৪

২। যে কোন পাঁচটি প্রশ্নের উত্তর দাও : ৮×৫

ক) একটি কারখানার উৎপাদন বিভাগ কার্য অর্ডার পদ্ধতিতে রাওয়ান প্রিমিয়াম বোনাস পরিকল্পনা অনুসারে শ্রমিকগণ মজুরি পাইবে। শ্রমিকগণ 48 ঘণ্টা সপ্তাহের জন্য 1200 টাকা মহার্ঘভাতা পাইবে।

একজন শ্রমিক মূল মজুরি দৈনিক ৮ ঘণ্টার জন্য 200 টাকা পাইবে এবং এক সপ্তাহে তাঁহার কার্যের সময়-তালিকা সংক্রে পে নিম্নরূপ :

Job No.	Time Allowed	Time Taken
121	25 hrs	20 hrs.
203	30 hrs	20 hrs
Idle time (waiting)	—	8 hrs

শ্রমিকের মোট সাপ্তাহিক মজুরি কত দেয় হইবে নির্ণয় কর। ৮

ঘ) পার্থক্য নির্ণয় কর :

i) 'বিক্রি(ত পণ্যের পড়তা' ও 'বিক্র(য়ের পরিব্যয়'(এবং

ii) 'স্থির ব্যয়' ও 'পরিবর্তনশীল পরিব্যয়'। ৪+৪

গ) কোনো একটি নির্দিষ্ট সময়ে A G Ltd এর আয়-ব্যয় সমতার বিক্র(য়ের পরিমাণ 2,50,000 টাকা এবং লাভ-আয়তন অনুপাত ছিল 20%। ঐ সময়ে তাঁদের নীট মুনাফার পরিমাণ ছিল 30,000 টাকা।

নির্ণয় কর—

i) ঐ সময়ে কোম্পানির স্থির ব্যয়ের পরিমাণ,

ii) প্রকৃত বিক্র(য়ের পরিমাণ, এবং

iii) নিরাপত্তার সীমা। ৩+৩+২

Conto

ঘ) SV enterprises 'ZEE' নামে একটি বিশেষ পণ্য উৎপাদন করে। 2018 সালের জন্য নিম্নলিখিত বিবরণগুলি সংগৃহীত হইয়াছিল—

i) 'ZEE' দ্রব্যের বার্ষিক চাহিদা — 24,000 একক (units)

ii) একটি ফরমায়েস (order) উপস্থাপনজনিত ব্যয় — 200 টাকা(

iii) প্রতি একক পিছু বার্ষিক carrying cost — Rs 13;

iv) স্বাভাবিক ব্যবহার — প্রতি সপ্তাহে 100 একক(

v) সর্বাধিক ব্যবহার — প্রতি সপ্তাহে 150 একক(

vi) পুনর্বার ফরমায়েস পাঠানোর সময়কাল 4 থেকে 6 সপ্তাহের মধ্যে(

vii) ন্যূনতম ব্যবহার — প্রতি সপ্তাহে 50 একক।

নিম্নলিখিত বিষয়গুলি গণনা কর :

1. পুনঃক্র(য় নির্দেশের পরিমাণ (Re-order Quantity);
2. পুনঃক্র(য় অর্ডারের মজুত স্তর (Re-order Stock Level);
3. সর্বনিম্ন মজুতস্তর (Minimum Stock Level); এবং
4. সর্বোচ্চ মজুত স্তর (Maximum Stock Level)

২+২+২+২

ঙ) টীকা লেখ (যে কোন দুইটি) :

i) অসমাপ্ত পণ্য(

ii) পরিব্যয় হিসাব নিকাশের উদ্দেশ্য(

iii) উপঠিকা (Sub-contract)

iv) ব্যয়ের সামগ্রিক বণ্টন এবং ব্যয়ের আনুপাতিক বণ্টন। ৪+৪

চ) একটি ফার্ম একটি নূতন পণ্য উৎপাদনের জন্য একটি যন্ত্র ক্রয় করিয়াছে। উক্ত পণ্যের পরিব্যয় এবং অন্যান্য তথ্যাদি নিম্নে প্রদত্ত হইল ঃ

অনুমিত ব্যয় (Estimated Costs) :

Direct Material Cost	:	Rs 8,000
Direct Wages	:	15% of direct material cost.
Factory Overhead	:	Rs 2,000
Administration Overhead	:	Rs 2,400
Selling & Distribution overhead	:	15% of sales
একক প্রতি অনুমিত লাভ		Re 0.17
বার্ষিক অনুমিত বিক্রয়		4000 units

পণ্যটির একক প্রতি বিক্রয়মূল্য নির্ণয় কর? ৮

ছ) নিম্নলিখিত বিবরণ হইতে টিকা হিসাব প্রস্তুত কর ঃ

	Rs.
Materials sent to site	1,80,000
Wages paid at site	90,000
Plant installed at site	2,40,000
Direct expenditure paid	28,500
Materials returned to stores	6,000
Establishment charges paid	12,000
Materials Lost by fire	15,000
Work certified	3,60,000
Cost of work not yet certified	9,000

Wages accrued due on 31st March, 2019	6,000
Direct expenditure paid in advance on 31st March 2019	1,500
Materials in hand on 31st Dec, 2019	12,000
Value of contract	5,40,000

The contract was started on and from 1st April, 2018. 90% of work certified is received in cash. Charge depreciation @ 15% on plant. ৮

জ) প্রণোদনামূলক মজুরি পদ্ধতির উদ্দেশ্য এবং বিশেষত্বগুলি কি কি? ৪+৪

ঝ) ঠিকা-পরিব্যয় নির্ণয় ব্যবস্থার মৌলিক বৈশিষ্ট্যসমূহ কি কি? অসমাপ্ত চুক্তি ভিত্তিক কাজের লাভের হিসাব কিভাবে করা হয়? ৪+৪

ঞ) নিম্নলিখিত তথ্যাদি হইতে (i) কাঁচামালের মূল্য ভেদমান (ii) কাঁচামালের দর ভেদমান এবং (iii) কাঁচামালের পরিমাণ ভেদমান নির্ণয় কর ঃ ২+৩+৩

i)	Standard quantity of materials for each unit of finished product	50 kg
ii)	Standard rate of material per kg	— Rs 2
iii)	Materials purchased	— 6000 kg
iv)	Cost of Material Purchased	—Rs 18000
v)	Opening stock of Materials	— 1000 kg
vi)	Closing stock of Materials	— 2000 kg
vii)	Actual production	— 160 units

৩। যে কোন দুটি প্রশ্নের উত্তর দাও : ১৫×২

ক) নিম্নলিখিত তথ্যাবলী হইতে ব্যাপক মেসিন-ঘন্টার হার নির্ণয় কর :

i) 13 machines in the department.

ii) Total machine cost of one machine to be depreciated — Rs 1,15,000; Life 10 years; Depreciation on straight line basis.

iii) Departmental area 35,000 square feet.

iv) Machine area 1,250 square feet.

v) Departmental Overhead (annual) :

Rent	Rs 25,000
Heat & Light	Rs 10,000
Supervision	Rs 65,000

vi) Annual cost of reserve materials for the machine — Rs 1500.

vii) Hours run on Production — 900 hrs

viii) Power cost Re 0.50 per hour of running time.

ix) Labour (a) When setting & adjusting, full time attention.

(b) When machine is producing, one man can look after 3 machines.

x) Labour rate Rs 3 per hour. ১৫

খ) টীকা লেখ (যে কোন তিনটি) :

i) বিন্ কার্ড ও দ্রব্যের খতিয়ান(

ii) গোষ্ঠী বোনাস(

Contd.

iii) ঠিকার নগদ প্রাপ্তি ও কর্তিত অর্থ(

iv) প্রান্তিক ব্যয়(

v) বুদ্ধিমত্তা নির্ধারণ (Merit rating)। ৫×৩

গ) একটি বিশেষ পণ্য সম্পূর্ণ পণ্যে রূপান্তরিত হইবার আগে দুইটি প্রক্রি(য়ার মধ্য দিয়া অতিক্র(ম করে। 2019 সালের মার্চ মাসে নিম্নলিখিত তথ্যসমূহ পাওয়া গিয়াছিল :

Items	Process I	Process II	Finished stock
	Rs	Rs	Rs
Opening stock	20,000	24,000	60,000
Direct Materials	35,000	40,000	—
Direct wages	35,000	32,000	—
Factor overhead	28,000	12,000	—
Closing stock	10,000	12,000	30,000
Profit Percentage on transfer price (to the next process)	25%	20%	—
Inter Process Profit for opening stock	—	4,000	22,000

Stocks in process are valued at Prime cost and finished ock has been valued at the price at which it was received om process II. Sales for the period were Rs 5,00,000.

প্তুত কর এবং নির্ণয় কর :

ক) প্রত্যেক ধাপে মুনাফাসহ প্রক্রি(য়ার হিসাবগুলি(

খ) প্রকৃত উপলব্ধ লাভ(এবং

P.T.O.

(i) মডেলটি Hawkins-Simon শর্তাবলী পূরণ করে কিনা পরীক্ষা কর।

(ii) শর্তাবলীর অর্থনৈতিক অর্থটি ব্যাখ্যা কর।

11. কোনো বিক্রয়লব্ধ আয় সর্বোচ্চকারী একচেটিয়া কারবারীর অন্ততঃপক্ষে 1500.00 টাকা লাভ প্রয়োজন। তার চাহিদা ও ব্যয় রেখার সমীকরণ যথাক্রমে $P = 304 - 2q$ এবং $C = 500 + 4q + 8q^2$। তার মোট উৎপাদন ও মূল্য নির্ণয় কর। এই মানগুলি সে মুনাফা সর্বোচ্চকারী হলে যে মান হতো তার সঙ্গে তুলনা কর।

2019

Part – II

ECONOMICS

(Honours)

Paper – V

Full Marks – 90

Time : 4 Hours

he questions are of equal value for any group / half.

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

FIRST HALF

(Public Economics and Environmental Economics)

Group – A

Answer any **five** questions : 2×5

1. (a) Give examples of positive and negative externalities in production.

   (b) What is Laffer Curve?

   (c) Distinguish between public good and private good.

   (d) Distinguish between progressive taxation and proportional taxation.

(e) Distinguish between optimum budget and balanced budget.

(f) What is WTP?

(g) Differentiate between fiscal deficit and budget deficit.

(h) Explain briefly the concept of vertical equity under the ability to pay principle of taxation.

Group – B

Answer any **three** questions : 5×3

2. Discuss the role of fiscal policy in a developing economy.
3. Write the characteristics of public goods.
4. What is GST? Explain the advantages of GST.
5. Write a note on optimal level of pollution.
6. Is there any difference between the burden of an internal debt and that of an external debt?
7. Write a note on free-rider problem and government intervention.

Group – C

Answer any **two** questions : 10×2

8. Explain the different components of budget.
9. Critically discuss the solution proposed by Lindhal regarding the optimal provision of public goods.

10. Discuss the advantages and disadvantages of expenditure tax vis-a-vis those of income tax.
11. Do you think that an indirect tax imposes an excess burden on a typical consumer compared with direct tax of equal yield ? — Discuss

SECOND HALF
(Mathematical Economics)
Group – A

Answer any **five** questions. 2×5

1. (a) Set up a "diet problem" as a standard example of LPP.

(b) What is the difference between primal and dual problems in LPP.

(c) Find Price elasticity of demand for the demand function $P = 130 - 3q$ at $q = 35$.

(d) What do you mean by surplus variables in the context of LPP ?

(e) The total cost function of a firm is $C=2q^3-3q^2+12q$. Show that at the minimum point of the AC curve, the average cost equals the marginal cost.

(f) The production function is given by $Q=AL^{3/4} K^{1/4}$. What is the nature of returns to scale?

(g) Check whether the function given below is homothetic or not : 2 log x + 3 log y.

(h) What is Benefit Cost ratio?

Group – B

Answer any **three** questions : 5 × 3

2. Formulate the dual of the following LPP :

$$\text{Min } C = 10x_1 + 14x_2$$
$$\text{Sub to } x_1 + 2x_2 \geq 6$$
$$x_1 + 5x_2 \geq 4$$
$$3x_1 + x_2 \geq 3$$
$$x_1, x_2 \geq 0$$

3. Consider the macro economic model :

$C = 89 + 0.6y$

$I = 120 - 150r$

$M^s = 275$

$M^D = 240 + 0.1y + 250r$

Determine equilibrium values of y and r and derive IS and LM equations.

4. Distinguish between Leontief open and closed model.

5. The demand and supply functions of a commodity are given by $Q^D = \frac{20-p}{3}$ and $Q^S = \frac{p}{2}$ respectively.

6. If the commodity is sold a perfectly competitive market what will be the4 amount of consumer's surplus ?

Consider the following input-output matrix :

	Agriculture	Manufacturing	Services
Agriculture	0.2	0.3	0.2
Manufacturing	0.4	0.1	0.2
Services	0.1	0.3	0.2

The final demand for agriculture, manufacturing and service sectors are 10.1, 5.3 and 5.6 respectively. Find out the output produced in the three sectors.

7. Compare the NPV and IRR methods of investment appraisal.

Group – C

Answer any **two** questions : 10 × 2

8. (i) Explain what do you mean by basic and non-basic variables in LPP.

(ii) Solve the following LPP by simplex method :

$$\text{Max } Z = 7x_1 + 5x_2$$
$$\text{Sub to } x_1 + 2x_2 \leq 6$$
$$4x_1 + 3x_2 \leq 12$$
$$x_1, x_2 \geq 0$$

9. Let the utility function and the budget courtraint of a consumer be given by :

$U = xy$ and $P_x \cdot x + P_y \cdot y = 100$ respectively

(i) Find the individual demand for x and y.

(ii) Show that these functions are homogenieous of degree zero in absolute prices and income.

10. Consider the following Leonlief system where the input-output coefficient matrix is given by :

$$\begin{bmatrix} 0.1 & 0.3 & 0.2 \\ 0.4 & 0.1 & 0.3 \\ 0.3 & 0.5 & 0.2 \end{bmatrix}$$

(i) Check whether the system satisfies the Hawkins-Simon conditions.

(ii) Give the economic interpretation of the condition.

11. A revenue maximising monopolist requires a profit at least Rs. 1500.00. His demand and cost functions are $P = 304 - 2q$ and $C = 500 + 4q + 8q^2$. Determine output level and price. Contrast these values with those that would be achieved under profit-maximisation.

Bengali Version

প্রথম অর্ধাংশ

(Public Economics and Environmental Economics)

বিভাগ - ক

যে কোনো পাঁচটি প্রশ্নের উত্তর দাও : 2 × 5

1. (ক) উৎপাদনে ধনাত্মক ঋণাত্মক বাহ্যিক প্রভাব বলতে কি বোঝ?

(খ) ল্যাফার রেখা কি?

(গ) সরকারী দ্রব্য ও বেসরকারী দ্রব্যের মধ্যে পার্থক্য কি?

(ঘ) প্রগতিশীল কর ও সমানুপাতিক করের মধ্যে পার্থক্য দেখাও।

(ঙ) কাঙ্খিত বাজেট ও সুষম বাজেটের মধ্যে পার্থক্য কি?

(চ) WTP কি?

(ছ) ফিসক্যাল ঘাটতি ও বাজেট ঘাটতির মধ্যে পার্থক্য কি?

(জ) কর প্রদানের সামর্থ্য নীতিতে উলম্ব সমতার ধারণাটি ব্যাখ্যা কর।

বিভাগ - খ

যে কোনো তিনটি প্রশ্নের উত্তর দাও। 5 × 3

2. উন্নয়নশীল দেশের অর্থনীতিতে রাজস্ব নীতির ভূমিকা আলোচনা কর।

3. সরকারী দ্রব্যের বৈশিষ্ট্যগুলি আলোচনা কর।

4. GST কি? GST-র সুবিধাগুলি আলোচনা কর।

5. দূষণের কাম্যস্তরের উপর সংক্ষিপ্ত টীকা লেখ।

6. আভ্যন্তরীণ ঋণভার এবং বৈদেশিক ঋণভারের মধ্যে কোন পার্থক্য আছে কি?

7. 'বিনামূল্যের আরোহী' সমস্যা এবং সরকারী হস্তক্ষেপের উপর একটি টীকা লেখ।

বিভাগ - গ

যে কোনো দুইটি প্রশ্নের উত্তর দাও। 10 × 2

8. বাজেটের বিভিন্ন অংশগুলি আলোচনা কর।

9. সরকারী দ্রব্যের কার্য্য স্তর নির্ধারণে লিনডালের সমাধানটি সমালোচনাসহ আলোচনা কর।

10. তুমি কি মনে কর পরোক্ষ কর, প্রত্যক্ষ করের তুলনায় ভোগকারীর উপর অতিরিক্ত বোঝা আরোপ করে, যেখানে পরোক্ষ ও প্রত্যক্ষ করের আয় উৎপাদন সমান।

11. আয়করের সঙ্গে ব্যয়করের সুবিধা অসুবিধার তুলনামূলক আলোচনা কর।

দ্বিতীয় অর্ধাংশ

(Mathematical Economics)

বিভাগ - ক

যে কোনো পাঁচটি প্রশ্নের উত্তর দাও ঃ 2 × 5

1. (ক) LPP-তে খাদ্য সমস্যার একটি উদাহরণ দাও।

(খ) LPP-তে primal এবং dual সমস্যাগুলির মধ্যে পার্থক্য নির্ধারণ কর।

(গ) চাহিদার স্থিতিস্থাপকতার মান নির্ণয় কর যখন

$P = 130 - 3q$ এবং $q = 35$.

(ঘ) Surplus Variables কি?

(ঙ) একটি ফার্মের মোট ব্যয় অপেক্ষকটি হল $C=2q^3-3q^2+12q$। দেখাও যে গড় ব্যয় রেখার সর্বনিম্ন বিন্দুতে গড় ও প্রান্তিক ব্যয় পরস্পরের সমান হয়।

(চ) একটি উৎপাদন অপেক্ষক হল—$Q=AL^{3/4} K^{1/4}$। এক্ষেত্রে মাত্রাজনিত প্রতিদানের বিধিটির ধরণ কেমন হবে?

(ছ) নিম্নে দেওয়া অপেক্ষকটি হোমোথেটিক কিনা দেখ—

$2 \log x + 3 \log y$.

(জ) Benefit Cost rati – কাকে বলে?

বিভাগ - খ

যে কোনো তিনটি প্রশ্নের উত্তর দাও। 5 × 3

2. নিম্নলিখিত LPP সমস্যাটির জন্য Dual সমস্যাটি নির্ণয় কর।

$$\text{Min } C = 10x_1 + 14x_2$$

$$\text{Sub to } x_1 + 2x_2 \geq 6$$

$$x_1 + 5x_2 \geq 4$$

$$3x_1 + x_2 \geq 3$$

$$x_1, x_2 \geq 0$$

3. নিম্নলিখিত সমার্থগত অর্থনৈতিক মডেলটি হল —

$C = 89 + 0.6y$

$I = 120 - 150r$

$M^S = 275$

$M^D = 240 + 0.1y + 250r$

y এবং r এর ভারসাম্য মান নির্ণয় কর। IS এবং LM রেখার সমীকরণ নির্ধারণ কর।

4. মুক্ত ও বদ্ধ লিওন্‌টিয়েফ মডেলের মধ্যে পার্থক্য কর।

5. কোন দ্রব্যের চাহিদা ও যোগান অপেক্ষকটি যথাক্রমে

$Q^D = \frac{20-p}{3}$ এবং $Q^S = \frac{p}{2}$। যদি দ্রব্যটি পূর্ণ প্রতিযোগিতার বাজারে বিক্রি হয় তাহলে ভোগকারীর উদ্বৃত্ত নির্ণয় কর।

6. নিম্নলিখিত উপাদান-উৎপাদন matrix টি বিবেচনা কর :

	কৃষি	শিল্প	সেবা
কৃষি	0.2	0.3	0.2
শিল্প	0.4	0.1	0.2
সেবা	0.1	0.3	0.2

তিনটি ক্ষেত্রের উৎপাদিত দ্রব্যের শেষ চাহিদা হল যথাক্রমে 10.1, 5.3 এবং 5.6। তিনটি ক্ষেত্রে উৎপাদিত দ্রব্যের পরিমাণ নির্ণয় কর।

7. বিনিয়োগ মূল্যায়নের NPV এবং IRR পদ্ধতিগুলির তুলনা কর।

বিভাগ - গ

যে কোনো দুইটি প্রশ্নের উত্তর দাও। 10 × 2

8. (ক) LPP-তে basic এবং non-basic চলরাশির মধ্যে পার্থক্য দেখাও।

(খ) নিম্নলিখিত LPP সমস্যাটির সমাধান কর :

$\text{Max } Z = 7x_1 + 5x_2$

$\text{Sub to } x_1 + 2x_2 \leq 6$

$4x_1 + 3x_2 \leq 12$

$x_1, x_2 \geq 0$

9. উপযোগিতা অপেক্ষক ও বাজেট সমীকরণটি যথাক্রমে

$U = xy$ এবং $P_x \cdot x + P_y \cdot y = 100$

(i) x এবং y দ্রব্যদুটির ব্যক্তিগত চাহিদারেখা নির্ণয় কর।

(ii) দেখাও যে এই অপেক্ষকগুলি দাম ও আয়ের সাপেক্ষে শূণ্যঘাত যুক্ত সমজাতীয় অপেক্ষক।

10. নিচের লিয়নটিয়েফ মডেলটি বিবেচনা কর, যার অনুশিল্প উপাদান সহগের matrixটি হল)

$$\begin{bmatrix} 0.1 & 0.3 & 0.2 \\ 0.4 & 0.1 & 0.3 \\ 0.3 & 0.5 & 0.2 \end{bmatrix}$$

(d) What is meant by 'the sea of faith' ? How does the poet illustrate this ?

(e) Discuss the symbolism of the 'Seven Stars' in Rossetti's "The Blessed Damozel."

(f) Bring out the significance of the mythological reference in "The Lotos-Eaters".

2019

Part – II

ENGLISH

(Honours)

Paper – V

(New syllabus)

Full Marks – 90

Time : 4 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer **any three** questions, taking at least one from each section : 15×3

SECTION – I

(a) How does Dickens portray the system of criminal justice in Victorian England in *Oliver Twist* ?

(b) In what ways is *Jane Eyre* influenced by the tradition of the Gothic novel ? What do the Gothic elements contribute to the novel ?

(c) Critically comment on Hardy's treatment of the female characters in *The Mayor of Casterbridge.*

SECTION – II

(d) Write a note on the central theme of Tennyson's *Ulysses.* Does it reflect the poet's own self ?

(e) Analyze the character of the Duke as you find him in Browning's "*My Last Duchess*".

(f) Write a short note on the use of imagery in "The Darkling Thrush".

2. Answer **any one** of the following questions : 10×1

(a) How does Carlyle assess Dante in his "Hero as Poet" ?

(b) What, according to, Arnold, is 'intellectual deliverance' ? How does this 'deliverance' contribute to 'modernity' in literature' ?

3. Answer **any one** of the following questions : 10×1

(a) Comment on the themes of temptation and sin as embodied in 'An Apple Gathering.'

(b) Explain the ways in which Hopkins portrays Nature in his poem, "Pied Beauty."

(c) How does Dickinson visualise 'death' in her "I Heard a Fly Buzz."

4. Answer **any one** of the following questions : 10×1

(a) Write a note on the significance of the Chartist Movement in the Victorian England.

(b) Write a brief note on the range and variety of the non-fictional prose in the Victorian era.

5. Answer **any three** of the following questions : 5×3

(a) Who wants to take Oliver off the parishes and why was he refused ?

(b) How do Bessie and Mr. Lloyd help Jane after she is punished in the Red Room and how is this event significant ?

(c) Explain the symbol of the 'caged goldfinch' in *The Mayor of Casterbridge.*

(c) Write a short note on Milton's grand style as evident in *Paradise Lost* Book – I.

9. Answer **any two** of the following : 5×2

(a) Comment on the dramatic significance of the first scene of *The Rivals*.

(b) Point out the importance of the character of Fag in *The Rivals*.

(c) Bring out the symbolic significance of Cleopatra's Ruby Bracelet.

(d) Why is Satan called 'an infernal serpent' ?

(e) "The paths of glory lead but to the grave"– What does Gray suggest in this line ?

(f) "My vegetable love should grow..." – What does Marvell mean by 'vegetable love' ?

R-7

2019

Part – II

ENGLISH

(Honours)

Paper – III

(New syllabus)

Full Marks – 90

Time : 4 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

1. Answer **any one** of the following : 8×1

(a) Write a note on the impact of the Restoration on the late seventeenth century English literature.

(b) Critically evaluate the impact of the Enlightenment on the 18th century English sociecty and literature.

GROUP – B

2. Answer **any one** of the following : 12×1

(a) "*The Rivals* is primarily a drama of situations and intrigues." Elucidate.

(b) Write a critcal note on the role of Mrs. Malaprop in *The Rivals*.

(c) Consider *All for Love* as a heroic tragedy.

(d) Discuss how Dryden portrays the character of Cleopatra is *All for Love*.

3. Answer **any one** of the following : 8×1

(a) The avowed aim of the Spectator was "to enliven morality with, and to temper wit with morality." Discuss Addison's essay 'Sir Roger at Home' in light of this comment.

(b) Show how Steele draws characters in his essay 'Spectator Club.'

4. Answer **any one** of the following : 12×1

(a) How does Swift use irony in *Gulliver's Travels* (Book-I) ? Discuss.

(b) Write a character sketch of the Lilliputians as represented in *Gulliver's Travels* (Book – I).

(c) Discuss how Aphra Behn represents slavery and racism in her novel *Oroonoko*.

(d) Write a critique of Behn's treatment of Imoinda in *Oroonoko*.

5. Answer **any one** of the following : 8×1

(a) Comment on the portrayal of the widow figure in *Oroonoko*.

(b) Comment on Gulliver's first meeting with the Lilliputians as represented in *Gulliver's Travels* (Book – I).

GROUP – C

6. Attempt **any one** of the following : 12×1

(a) "Milton," Wrote Blake, "was a true poet, and of the devil's party without knowing it." How far is this comment justified in light of the way Milton portrays Satan in *Paradise lost*, Book – I ? Discuss.

(b) Justify Pope's use of the elaborate supernatural machinery in *The Rape of the Lock*.

7. Answer **any one** of the following : 12×1

(a) Comment on Marvell's treatment of carpe-diem theme in "To His Coy Mistress".

(b) Discuss the role played by childhood in Vaughan's poem 'The Retreat'.

8. Answer **any one** of the following : 8×1

(a) Consider Gray's 'Elegy Written in a Country Churchyard' as an elegy.

(b) Discuss the significance of the cave of spleen in *The Rape of the Lock*.

UNIT - V

10. Write in brief the impact of cyclone on the coastal environment of the Purba Medinipur district. 4

Or

Discuss the impact of physiography on tea plantation of the Darjeeling region. 4

Group – C

(Short answer type questions)

Answer any **ten** questions within **50** words. 2×10

11. What do you mean by 'Bharatvarsha'?
12. Write short note on Kosmos.
13. Give an account of the development of mathematical geography during pre-christian era.
14. What is a nodal region?
15. What do you mean by dhrien?
16. What are the Xerophytic plants?
17. What do you mean by logical positivism?
18. Why is Paschimanchal of West Bengal called as backward region?
19. Define SEZ.
20. What do you mean by bursts of monsoon?
21. What is feminism?
22. Write about 'Decan trap' in peninsular India.
23. Define systematic geography.
24. What is cultural determinism?
25. What is 'Genre-de-vie'?

2019

Part – II

GEOGRAPHY

(Honours)

(New Syllabys)

Paper – IV

Full Marks – 90

Time : 4 Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Group – A

(Long answer type questions)

Answer any **five** questions, selecting one from each Unit within 500 words. 10×5

UNIT - I

1. Give a brief account on the development of Geographical thought in the mediaeval period and assess its role in the foundation of scientific geography. 6+4

Or

"Quantitative Revolution brings a revolutionary change in geographical analysis"—justify the statement. 10

UNIT - II

2. Critically analyse the views of radical geography and its importance in modern geographical research. 6+4

Or

Evaluate the impact of ecological approach on geographical studies and mention its merits. 10

UNIT - III

3. Classify the Indian soil on the basis of formation process. What is Himadri? 8+2

Or

Discuss the different views for the origin and mechanism of monsoon. 10

UNIT - IV

4. Give an account of the growth and development of tourism industry in India and state its impact on regional economy. 10

Or

Critically examine the role of industrial policy for the development of industries in India since independence. 10

UNIT - V

5. Analyse the geographical characteristics of Sundarban and bring out its specific identity as zoo geographical region. 10

Or

Bring out the salient features of marusthali as a climatic region. 10

Group – B

(Semi-long answer type questions)

Answer any *Five* questions, selecting one from each Unit within 250 words. 4×5

UNIT - I

6. Analyse the concepts of location and space in geographical methodology. 4

Or

Briefly discuss the contribution of Humboldt in Geography. 4

UNIT - II

7. In what way Ne-determinism is different from diterminism? 4

Or

Differentiate systematic Geography from Regional Geographical approach. 4

UNIT - III

8. Enumerate the reasons behind seasonality and unreliability of rainfall in India. 4

Or

Classify the natural vegetation of India. 4

UNIT - IV

9. What is the relationship between green revolution and food security? 4

Or

Write the problems of tourism industry in India. 4

Enumerate the needs for regional planning in India. 7+3=10

4. What are the different stages of economic growth according to W.W. Rostow? Discuss the salient features of these stages. Analyze the limitations of this theory. 2+5+3

2019

B.Sc. (Hons.)

4th Semester Examination

GEOGRAPHY (Hons.)

Paper—C8T

Regional Planning and Development

Full Marks : 60 Time : 3 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group-A

Answer any *ten* questions, selecting from the following 10×2

1. What is formal region ?
2. What do you mean by hierarchy of region ?
3. Define Regional Planning.
4. What do you mean by Five Year Plan ?
5. What is Centralised Planning ?
6. What do you mean by Supply Area and Demand Area ?

7. Define Metropolitan Area.

8. What do you mean by 'adhoc' region ?

9. What do you mean by 'balanced development' ?

10. Distinguish between 'plan' and 'project'.

11. Write the major indicators of underdevelopment at 'Jangalmahal region' in West Bengal.

12. What do you mean by 'efficiency-equity' debate ?

13. Distinguish betwen 'multi-purpose planning' and 'multi-level planning.'

14. How does urban design influence regional planning ?

15. Write any two disadvantages of multi level planning.

Group-B

Answer any *four* questions, selecting from the following 4×5

1. Analyze the evolutions of Urban Agglomeration.

2. Discuss the significance of Human Development Index.

3. Distinguish between growth and development with

proper example. What is 'green growth'? 3+2=5

4. Schematically detect the mearurable economic, social and environmental indicators for development in any region. 5

5. What is multi-level planning ? Highlight its advantages and disadvantages in development. 2+3=5

6. Distinguish between upward and downward transition region based on John Friedmann's theory (1963) of development.

Group-C

Answer any *two* questions, selecting from the following 2×10

1. Elucidate the concept of functional Regions. Analyze different methods of delineating the functional Regions. 4+6

2. Describe the Growth Pole Theory of Perroux specifying its central idea, salient features and mechanism for regional development.
Enlighten the relevance of this theory in Indian context. 7+3=10

3. Discuss the major principles and objectives of an ideal regional planning.

[Turn Over]

2019

B.Sc. (Hons.)

4th Semester Examination

GEOGRAPHY (Hons.)

Paper—C10T

Full Marks : 40 Time : 2 Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group-A

Answer any *five* questions 2×5=10

1. What do mean 'Agriculture Man' ?
2. What is 'Environmental Ethics' ?
3. Distinguish between 'Ecology and Ecosystem'.
4. What is 'stone cancer' ?
5. What is the importance of 'World Environment Day' ?
6. What are the external controlls of ecosystem ?

7. What are the main aspect of wildlife protection Act of 1972 ?

8. What are the types of succession in ecosystem ?

Group-B

Answer any *four* questions 4×5=20

1. Make a comperative analysis between Marine ecosystem and Terrestrial ecosystems.

2. Mention the environmental policies and acts in India from 1972 to 2015.

3. Mention how industrialization is responsible for air pollution.

4. How does the human perception on environment change with time ?

5. Distinguish between system approach and holistic environment approach.

6. Briefly discuss the causes of water pollution.

Group-C

Answer any *one* questions 1×10=10

1. Discuss the structure of Ecosystem. Identify its major functions in an environment. 5+5

2. Describe the problems of waste management in urban areas of India.

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