বিদ্যাসাগর বিশ্ববিদ্যালয়

VIDYASAGAR UNIVERSITY

Question Paper

B.Sc. Honours Examinations 2022

(Under CBCS Pattern)

Semester - IV

Subject : PHYSICS

Paper : SEC 2 - T

Full Marks : 25

Time : 2 Hours

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

[COMPUTATIONAL PHYSICS]

Group - A

Answer any ***two*** questions : 5×2=10

1. (a) What is syntax in computer programming language? 2

   (b) Discuss different types of Fortran loops. 3

2. (a) Write down the syntax of IF statement in Fortran. 1

   (b) What are the user defined and built-in functions in Fortran? Explain with examples. 2+2

3. (a) What is Gnuplot? Write down commands to plot $y = \sin(x)$ and $y = xe^x$. 2+2

   (b) How to plot data from a file in Gnuplot? 1

P.T.O.

Group - B

Answer any ***one*** question : 15×1=15

4. (a) What is Flowchart? Write down flowchart for IF-ELSE statement in Fortran. 2+3

   (b) Discuss relational and logical operators with examples in Fortran. 2+2

   (c) Discuss how to prepare a basic Latex file. 6

5. (a) Write down algorithm to compute factorial value of an integer number. 4

   (b) How to define Latex commands? Give examples. 3

   (c) Write down Latex commands to generate the following expressions : 2+2

   (i) $\frac{(-1)^n}{(2n+1)!}x^{2n+1}$

   (ii) $\int_0^1 \sqrt{1+x}\ dx$

   (d) Write down Linux commands to 1×4

   (i) Rename a file.

   (ii) Change to home directory.

   (iii) Create or update file.

   (iv) Display all running processes.

OR

[BASIC INSTRUMENTATION SKILL]

Group - A

Answer any ***two*** questions : 5×2=10

1. How is the universal counter used for the measurement of frequency? 5

2. What is a multimeter? How is it used as a voltmeter? 5

3. Discuss any LCR bridge in detail with the help of a diagram. 5

Group - B

Answer any ***one*** question : 15×1=15

1. (a) Explain the principle of working of Digital Storage Oscilloscope (DSO).

   (b) How is the electrostatic focusing achieved in CRT? Explain it with the help of a diagram.

   (c) Why is a fluorescent screen used in CRT? Name some fluorescent materials used in CTR screen. 7+5+3

2. (a) Explain accuracy, precision and sensitivity of an instrument.

   (b) A set of independent current measurement taken by four observers was recorded as 55.02 μA, 55.11 μA, 55.05 μA and 55.08 μA. Calculate the average current and average deviation.

   (c) Explain the working principle of a pulse generator with the help of a block diagram. 5+5+5

OR

[RENEWABLE ENERGY AND ENERGY HARVESTING]

Group - A

Answer any ***two*** questions : 5×2=10

1. (a) Explain in brief the reasons for energy crises.

   (b) Define renewable energy sources and give its two examples. 3+2

2. (a) Solar energy is the best energy source. Explain.

   (b) Give any two limitations of solar energy.

   (c) What is solar green house? 2+1+2

3. (a) What are the advantages of wave energy?

   (b) Describe the environmental impact of Hydro power sources. 2+3

Group - B

Answer any ***one*** question : 15×1=15

4. (a) What is geothermal energy? Describe the types of geothermal sources.

   (b) What is meant by energy harvesting? What is the use of carbon captured technology?

   (c) Explain the structure and operation of linear electromagnetic generator.

   (d) What are the advantages of wind energy conversion system? (2+3)+(2+1)+(5+2)

5. (a) What is ocean thermal energy? Give its conversion principle.

   (b) State the merits and demerits of solar cell.

   (c) Discuss the principle and working of photovoltaic cell.

   (d) What is biomass energy? What is biochemical conversion? (2+1)+3+5+(2+2)

P.T.O.

OR

[APPLIED OPTICS]

Group - A

Answer any ***two*** questions : 5×2=10

1. (a) What are the differences between a hologram and an ordinary photograph?

   (b) What are the main requirements for making a hologram? 3+2

2. (a) What is population inversion necessary to obtain a Laser? What is a metastable state?

   (b) Calculate the wavelength of radiation emitted by an LED made up of a semiconductor material with bandgap energy 2.8 eV. 3+2

3. (a) Explain how the light is guided by an optical fibre.

   (b) What is meant by acceptance angle for an optical fibre? 3+2

Group - B

Answer any ***one*** question : 15×1=15

4. (a) Derive the relationship between Einstein's A and B coefficients.

   (b) What are the main components of a Laser system?

   (c) The output power of a given Laser is 1mW and the emitted wavelength is 630 nm. Calculate the number of photons emitted per second. If the area of the laser beam is 10^{-6} m^2, then find the intensity of the laser beam.

   (d) Draw the energy level diagram and discuss the working of He-Ne laser. 5+2+3+5

5. (a) What are the differences between step index fibre and graded index fibre?

   (b) What do you mean by modes of a fibre? Compare between single mode and multimode fibres?

   (c) Mention the uses of holography.

P.T.O.

(d) The core of a glass fibre has refractive index 1.5, while its cladding is doped to give fractional change in refractive index equal to 0.005. Find (i) refractive index of clad (ii) critical internal reflecting angle (iii) acceptance angle and (iv) numerical aperture.

4+4+2+5