

**B.Sc. 4<sup>th</sup> Semester (Honours) Examination, 2022 (CBCS)**  
**Subject: Physics**  
**Paper: SEC-2**  
**(Computational Physics Skill)**

**Time: 2 Hours**

**Full Marks: 40**

*The figures in the margin indicate full marks.*

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

**Group-A**

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

- a. Draw the Flowchart symbol for input and decision in Fortran.
- b. Explain the basic data types in Fortran.
- c. How to define a function in Fortran?
- d. What is IMPLICIT NONE statement in Fortran?
- e. Write code in Fortran to create a complex number.
- f. Write Latex statement to generate table of contents in a document.
- g. How to write greek letters within a text line in Latex? Give four examples.
- h. Write gnuplot statements to insert levels on the X and Y axis.

**Group B**

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

- a. Explain the syntax of GOTO statement in Fortran and describe its merits and drawbacks.
- b. Distinguish *Function Subprogram* and *Subroutine Subprogram*.
- c. Write a program in Fortran to find the maximum and minimum numbers.
- d. Describe the advantages and disadvantages of Latex in comparison with word processor.

### Group C

3. Answer any *two* of the following questions:

10×2 = 20

a. Explain the structure of Fortran coding sheet. Write the syntax of two Nested Block IF statements in Fortran with necessary examples. 5+5

b. Describe how to include image files in Latex document. Write the Latex statement to generate references and citations in a Latex document. 5+5

c. Write the Latex code to construct the following table:

Table 1: Table with some variables

Value 1	Value 2	Value 3
$\alpha$	$\beta$	$\gamma$
1	110	a
2	12	b
3	23	c

d. Write gnuplot statement for matrix plot with examples. Describe the use of multiplot statement in gnuplot with examples. 5+5

**B.Sc. 4<sup>th</sup> Semester (Honours) Examination, 2022 (CBCS)**

**Subject: Physics**

**Paper: SEC-2**

**(Electrical Circuits & Network Skills)**

**Time: 2 Hours**

**Full Marks: 40**

*The figures in the margin indicate full marks.*

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

**Group-A**

**2. Answer any *five* questions from the following:**

**2×5=10**

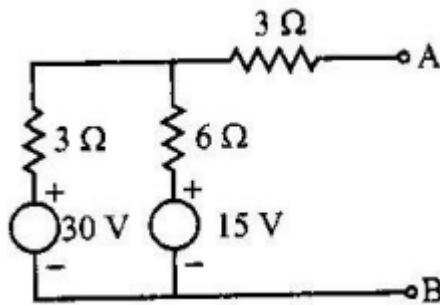
- a) Derive the vector form of Ohm's law.
- b) A copper wire of radius 0.1 mm and resistance 1 k $\Omega$  is connected across a power supply of 20 V. (i) How many electrons are transferred per second between the supply and the wire at one end? (ii) Write down the current density in the wire.
- c) Define and explain 'Quality factor' of series resonance circuit.
- d) What is the effective resistance in series and parallel combination?
- e) Discuss the significance of 'power triangle'.
- f) Explain reverse biasing of a *p-n* junction diode.
- g) What is a choke coil ?
- h) What is soldering?

## Group-B

2. Answer any two of the following questions:

5×2=10

- a) A copper rod of length 20 cm and cross-sectional area  $2 \text{ mm}^2$  is joined in parallel with a similar aluminium rod. Find the resistance of the combination between the ends. Resistivity of copper =  $1.7 \times 10^{-8} \Omega\text{m}$  and resistivity of aluminium =  $2.6 \times 10^{-8} \Omega\text{m}$ .  
5
- b) A current  $i = 14.14 \sin(\omega t - \frac{\pi}{6})$  flows in an electric circuit when a voltage of  $v = 141.4 \sin \omega t$  is applied to it. Determine the value of true power, apparent power and reactive power.  
5
- c) State Thevenin's theorem. Obtain the Thevenin's equivalent circuits for the circuit shown in figure.



2+3

- d) How is forward biasing different from reverse biasing in a  $p-n$  junction diode? With the help of a circuit diagram, explain the use of this device as a half-wave rectifier.

2+3

## Group-C

3. Answer any two of the following questions:

10×2=20

- a) A series LCR circuit is connected to an a.c. source. Using the phasor diagram, derive the expression for the impedance of the circuit. Plot a graph to show the variation of current with frequency of the source.  
7+3
- b) In India, domestic power supply is at 220 V, 50 Hz, while in USA it is 120 V, 60Hz. Give one advantage and one disadvantage of 220 V supply over 120 V supply. For very

high frequency a.c. supply, a capacitor behaves like a pure conductor. Why? Describe star and delta connection in detail.

2+2+6

- c) Derive an expression for the energy stored in an inductor. A 200 km long telegraph wire has a capacity of  $0.014 \mu\text{F}$  per km. If it carries an alternating current of 50 kHz. What should be the value of an inductance required to be connected in series so that impedance is minimum? Take  $\pi = \sqrt{10}$ .

5+5

- d) Mention various energy losses in a transformer. Draw waveform of three phase AC generators. Explain working principle of DC motors.

2+2+6