



K24U 3719

Reg. No. : .....

Name : .....

**III Semester B.Sc. Degree (CBCSS – Supplementary)  
Examination, November 2024  
(2018 Admission)  
CORE COURSE IN PHYSICS  
3B03PHY : Allied Physics**

Time : 3 Hours

Max. Marks : 40

- Instructions :**
- 1) Write answers only in **English**.
  - 2) Section **A** : Answer **all** questions. (Very short answer type. **Each** question carries **1** mark)
  - 3) Section **B** : Answer **any seven** questions. (Short answer type. **Each** question carries **2** marks)
  - 4) Section **C** : Answer **any four** questions. (Short essay/problem type. **Each** question carries **3** marks)
  - 5) Section **D** : Answer **any two** questions (Long essay type. **Each** question carries **5** marks)

**SECTION – A**

1. In diamond structure the coordination number of each carbon atoms is \_\_\_\_\_
2. \_\_\_\_\_ theorem gives the velocity of efflux of a liquid through an orifice.
3. The SI unit of rigidity modulus is \_\_\_\_\_
4. An AC voltage of angular frequency  $\omega$  is applied to a series RC circuit. The phase difference between voltage and current is \_\_\_\_\_ **(4×1=4)**

**SECTION – B**

5. Why zeroth order diffraction is not considered in x-ray diffraction ?
6. Sketch (111) plane in a cubic unit cell.

P.T.O.



7. Define packing fraction in crystal structure ? Obtain the packing fraction for a body centered cubic structure.
8. For transmitting torque, a hollow shaft is found to be stronger than a solid shaft of same length, mass and material. Why ?
9. Discuss the equation of continuity for the streamline flow of incompressible fluids.
10. What is meant by terminal velocity of an object in a viscous medium ?
11. Small mercury droplets are spherical and larger one tends to be flattened. Why ?
12. State reciprocity theorem in electrical network analysis.
13. What is meant by skin effect in AC circuits ?
14. Why is choke coil preferred over a resistance to control ac current ? **(7×2=14)**

#### SECTION – C

15. Lithium has a bcc structure. Its density is  $530 \text{ kg/m}^{-3}$  and its atomic mass is 6.94 amu. Calculate the edge length of a unit cell of Lithium metal.
16. Copper with fcc structure has a lattice parameter of  $3.61 \text{ \AA}$ . The first order Bragg reflection from (111) plane appears at an angle of  $21.7^\circ$ . Determine the wavelength of x-rays used.
17. A body suspended symmetrically from the lower end of a wire, 100 cm long and 1.22 mm in diameter, oscillates about the wire as axis with a period of 1.25 s. If the rigidity modulus of the material of the wire is  $8 \times 10^{10} \text{ N/m}^2$ , calculate the moment of inertia of the body about the axis of rotation.
18. The surface tension of soap solution is 0.03 N/m. Calculate the amount of work done in forming a bubble of radius 5 cm in air.
19. A DC battery of 50 V is connected to a series circuit containing a capacitance of  $1 \mu\text{F}$  and a resistance of 100 k $\Omega$ . Determine the time constant. Also find the charge on the capacitor and current in the circuit at a time 150 millisecond after the voltage is applied.
20. The self-inductance of a choke coil is 10 mH. When it is connected with a 10 V DC source then the loss of power is 20 W. When the same coil is connected with 10 V AC source the average power is 12.75 W. Calculate the frequency of AC source. **(4×3=12)**



SECTION – D

21. With the help of a neat diagram describe the principle of Laue's diffraction method. Explain the origin of Laue's spots. What is the utility of Laue's diffraction pattern ?
22. Derive the expression for the bending moment of a beam of uniform cross section in terms of Young's modulus, geometric moment of inertia and radius of curvature.
23. Derive the velocity distribution for flow of fluid through a capillary tube and arrive at Poiseuille's formula.
24. State Norton's theorem. With the help of diagrams explain how to Nortonize a given circuit. Discuss how Norton's equivalent circuit differs from Thevenin's equivalent circuit. **(2×5=10)**

