

B.Sc DEGREE EXAMINATION APRIL 2022  
BRANCH III - PHYSICS  
FOURTH SEMESTER

COURSE : ALLIED CORE  
PAPER : PHYSICS FOR CHEMISTRY II  
TIME : 3 HOURS

MAX. MARKS : 100

SECTION A

ANSWER ALL THE QUESTIONS  
CHOOSE THE CORRECT ANSWER:

25 MARKS  
(10x1=10)

- Magnetic field lines due to a current carrying long wire are
  - concentric circles
  - parallel to wire
  - of any shape
  - along north south direction
- The Maxwell's Equation given by  $\nabla \times \mathbf{B}$  states,
  - Gauss's Law
  - Faraday's Law
  - Ampere's Law
  - Hook's law
- When a substance is placed in a magnetic field its ability to get magnetized depends upon
  - permeability
  - susceptibility
  - magnetic viscosity
  - magnetic resonance
- If 'r' is the distance of a point P from a cylindrical charge distribution, the electric field at P is proportional to
  - 1/r
  - 1/r<sup>2</sup>
  - 1/r<sup>3</sup>
  - r
- The electric potential V at any point x,y,z in space is given by  $V=4x^2$  volt. The electric field at the point (1m,0,2m) in V/m is
  - 8 along negative x axis
  - 8 along positive x axis
  - 16 along negative x axis
  - 16 along positive x axis.
- Total internal reflection takes place when light travels from
  - air to glass
  - glass to air
  - rarer to denser medium
  - denser to rarer medium
- The Boolean identity  $A \cdot (B+C) = A \cdot B + A \cdot C$  is called
  - associative law
  - commutative law
  - distributive law
  - complement law
- The output of an integrator circuit using Opamp is taken across,
  - feed back resistor
  - feed back capacitor
  - input capacitor
  - input resistance
- A 0.2  $\mu\text{F}$  capacitor is charged to 4 volt gives a deflection of 10 cm when discharged through a B.G. If the time period of the galvanometer is 10 sec, the current sensitivity is
  - 5  $\mu\text{A/m}$
  - 5 A/m
  - 5  $\mu\text{m}$
  - 3 A/m
- If  $N_1$  and  $N_2$  are the number of atoms in the ground state and excited state respectively, then in population inversion:
  - $N_1 = N_2$
  - $N_1 < N_2$
  - $N_1 > N_2$
  - $N_1$  and  $N_2$  can be anything

**FILL IN THE BLANKS:****(5x1=5)**

11. Lorentz force is given by \_\_\_\_\_.
12. From Maxwell's electromagnetic equation  $\nabla \times E =$  \_\_\_\_\_.
13. Curie temperature is the temperature above which \_\_\_\_\_ material becomes paramagnetic.
14. For a charge 'q' outside the closed surface, the total normal electric flux  $\phi$  is \_\_\_\_\_.
15. The bandwidth of an op-amp is \_\_\_\_\_.

**ANSWER BRIEFLY****(5x2=10)**

16. State De Morgan's theorem.
17. Write a short note on graded index fibre.
18. Give any three properties of diamagnetic material.
19. State Gauss theorem.
20. For an Op Amp, CMRR is 95 dB and open loop gain is 200,000. Calculate the common mode gain.

**SECTION B****ANSWER ANY FIVE QUESTIONS****(5x6=30)**

21. A sample of iron develops a magnetic moment  $8000 \text{ Am}^2$ . If the area of cross section of the sample is  $16 \text{ sq.cm}$  and its length is  $5 \text{ cm}$ , Calculate (i) intensity of magnetisation (ii) magnetic induction (iii) Permeability and (iv) Susceptibility of the sample when the magnetising field intensity is  $2 \times 10^7 \text{ A/m}$ .
22. Derive an expression for the acceptance angle of the optical fibre.
23. Explain the principle of capacitor. Deduce an expression for capacitance of a parallel plate capacitor with dielectric.
24. Show that  $(A+B)(A'+C)(B+C) = (A+B)(A'+C)$  and implement a logic circuit.
25. Explain with diagram the basic principles of holography.
26. List down the characteristics of an op-amp. An op-amp inverting amplifier has an input resistor  $10 \text{ k}\Omega$  and a feedback resistor  $50 \text{ k}\Omega$ . If the input voltage is  $0.5 \text{ V}$ , find the output voltage and the input current.
27. a) What is the force experienced by a stationary charge in an electric field and a magnetic field?  
b) A wire  $0.6 \text{ m}$  long carrying current of  $3 \text{ amp}$  is located in a region in which there is a magnetic field of  $0.015 \text{ Tesla}$ . Find the magnitude of the magnetic force on the wire if the angle between the wire and the field is  $90^\circ$ .

**SECTION – C****Answer any THREE question:****(3 x15=45)**

28. With a neat diagram, describe the magnetometer method of tracing the hysteresis curve. Deduce an expression for energy loss.
29. What is meant by virtual ground? Obtain an expression for the voltage gain of a Non inverting amplifier and differentiator.
30. Describe the principle, construction and working of a moving coil galvanometer. Obtain an expression for current sensitivity and charge sensitivity.
31. Explain the principle, construction, working and application of carbon dioxide laser.
32. State Gauss's law. Discuss in detail the different cases of determining the field at a point due to uniformly charged sphere.

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