STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086
(For candidates admitted during the academic year 2019 – 2020 and thereafter)

B.Sc. DEGREE EXAMINATION APRIL 2024
BRANCH III - PHYSICS
FOURTH SEMESTER

COURSE : ALLIED CORE
PAPER : PHYSICS FOR CHEMISTRY II
SUBJECT CODE : 19PH/AC/PC43
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION A

ANSWER ALL THE QUESTIONS **25 MARKS**
CHOOSE THE CORRECT ANSWER: **(10x1=10)**

1. If the electric flux through a surface is positive
   a) then the flux lines are directed inward b) then the flux lines are directed outwards
   c) no flux lines through the surface d) flux lines are parallel to each other
2. For an infinite sheet of positive charge, the electric field lines:
   a) are parallel to the sheet of charge
   b) are perpendicular to the sheet of charge and point toward the sheet
   c) are perpendicular to the sheet of charge and point away from the sheet
   d) fall off as one over other
3. The magnitude of force on a current carrying conductor placed in a magnetic field is independent of
   a) flux density b) length of conductor
   c) cross- sectional area of conductor d) current flowing through the conductor
4. When a current 'I' flows through a coil of area 'A' of a Moving Coil Ballistic Galvanometer then the torque acting on it is equal to
   a) NIA/B b) NIB/A
   c) NBIA d) NBA/I
5. Maxwell's first equation is based on
   a) Gauss's law for magnetism b) Gauss's law for electrostatic
   c) Ampere's circuital law d) Faraday's law
6. The area enclosed by hysteresis loop is a measure of
   a) retentivity b) susceptibility
   c) permeability d) energy loss per cycle
7. Which of the following is used for the formation of holograms?
   a) X-ray b) Visiblelight
   c) Infrare d) Lasers
8. Which of the following is not the property of Laser light?
   a) chromaticity b) coherence
   c) high intensity d) directionality
9. The input resistance of an ideal operational amplifier is
   a) zero b) infinity
   c) unity d) same as output resistance
10. According to De-Morgan's theorem a NAND gate is equal to
   a) bubbled OR b) bubbled AND
   c) bubbled NOR d) bubbled X-OR

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

11. Any charge in space with dimensions less than its distance away from a point of interest can be considered as a _____
12. In Fleming's let hand rule the middle finger represents _____
13. In a moving coil galvanometer, if the current flowing through it is increased then the deflection in the coil _____
14. The state of population inversion, with laser action necessary for stimulated emission is By _____
15. Simplification of A (A+B) is _____

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

16. State Coulomb's inverse square law.
17. Define the term coercivity.
18. What is meant by Figure of Merit?
19. Give any three characteristics of optical fibres?
20. State Demorgan's theorem.

SECTION - B

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

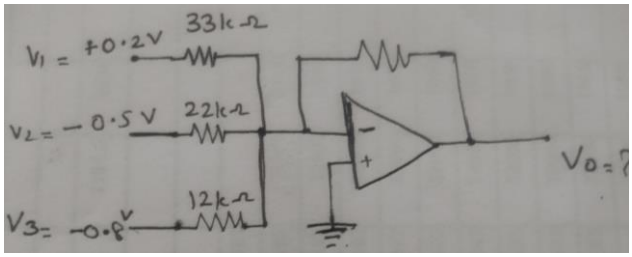
21. A parallel plate capacitor consists of two plates of area 100 sq.m each and separated by a distance of 10 m. A square glass slab of thickness 5 m is placed betwee the plates. Find the capacity of the capacitor. (ε_r =10).
22. A thin spherical shell of metal has a radius of 0.25m and carries a charge of $0.2x10^{-6}$ C. Calculate the electric intensity at a point
    i) inside the shell ii) just outside the shell and iii) 3m from the centre of the shell.

23. A capacitor charged up to 2 volts is discharged through a ballistic galvanometer having time period of 15 seconds and current sensitivity $2.5x10^{-8}$ amp/cm. If the first and the eleventh throws of galvanometer are 9.6 cm and 8 cm respectively. Calculate the charge passing through the B.G.

24. With schematic diagram explain Carbon Dioxide laser and list out its applications.

25. Write down the Maxwell's Electromagnetic equations and mention its physical significance.

26. Calculate the output voltage of the circuit for R_f =68KΩ



27. Simplify the Boolean function Y=A'BC +AB'C' +A'B'C'+ AB'C +ABC and implement the simplified function using logic gates.

SECTION – C

Answer any THREE question: (3 x15=45)

28. State and prove Gauss's theorem and use the theorem to find the electric field at a point due a cylindrical charge distribution.
29. Describe Magnetometer method of tracing hysteresis curve of a sample of iron in the form of a long thin rod.
30. Explain the construction of a moving coil ballistic galvanometer. Derive an expression between the quantity of charge flowing and the throw obtained. Also explain the damping correction.
31. Describe the construction and working of ammonia MASER.
32. Explain with necessary theory how an Op-Amp can be used as
    a) differentiator
    b) integrator.

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