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

SUBJECT CODE : 19PH/AC/PC43

B.Sc. DEGREE EXAMINATION APRIL 2023
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 **25 MARKS**
CHOOSE THE CORRECT ANSWER: **(10x1=10)**

1. A charge q is enclosed by a Gaussian spherical surface of radius R. If the radius of spherical surface is doubled, then the electric flux through the surface will
   (a) Be doubled (b) Increase four times
   (c) Be reduced to half (d) Remains the same

2. If the capacitance of a conductor carrying a charge of 8 C is 0.005 F, calculate its potential
   (a) 1600 V (b) 0.16V
   (c) 0.04V (d) 800V

3. What is the representation of permeability?
   (a) coercivity/retentivity (b) flux/flux density
   (c) Magnetic force/magnetic flux density (d) Magnetic flux density/magnetic force

4. Magnetic field can be produced by _____.
   (a) Conduction current (b) Displacement current
   (c) Both conduction and displacement current (d) It is produced naturally

5. Ballistic galvanometer with high oscillation period and high critical resistance would be best suited for measurement of _____.
   (a) Capacitance (b) Inductance
   (c) Current (d) Voltage

6. The deflection in moving coil galvanometer is
   (a) Inversely proportional to the area of the coil
   (b) Directly proportional to the torsional constant
   (c) Inversely proportional to the current flowing
   (d) Directly proportional to the number of turns of the coil.

7. Which of the following is the unique property of LASER.
   (a) Directional (b) Speed
   (c) Coherence (d) Wavelength

…2

8. What is the need to achieve population inversion?
   (a) To excite most of the atoms (b) To bring most of the atoms to ground state
   (c) To achieve stable condition (d) To reduce the time of production of laser

9. Which among the following is the most widely used constant gain amplifier circuit?
   (a) Inverting amplifier (b) Difference amplifier
   (c) summing amplifier (d) Non inverting amplifier

10. (A+B)(A′.B′) =
   (a) 1 (b) 0
   (c) AB (d) AB′

FILL IN THE BLANKS: (5x1=5)

11. _____ is the formula for flux of electric field.
12. The relationship between relative permeability and magnetic susceptibility of the medium is _____.
13. The deflection θ is related to the electric current I in a galvanometer by the relation _____.
14. LASER is the short form of _____.
15. The Boolean identity A. (B+C) = A.B+A.C is called _____.

ANSWER BRIEFLY (5x2=10)

16. State Coulomb's law of inverse square.
17. What is retentivity?
18. How do you find the figure of merit of a galvanometer?
19. What is the principle of fibre optics?
20. Define CMRR.

SECTION B

ANSWER ANY FIVE QUESTIONS (5x6=30)

21. An infinite long wire is stretched horizontally 4 meters above the surface of the earth. It has a charge of 100 micro-coulomb per metre of its length. Calculate the electric field at a point on earth vertically below the wire.
22. When 1.0×10^{12} electrons are transferred from one conductor to another, a potential difference of 10V appears between the conductors. Calculate the capacitance of the two conductor system.
23. Magnetic field and magnetic intensity are respectively 1.8 T and 1000 A/m. Find relative permeability and susceptibility.
24. When 0.1 coulomb of charge is passed through a moving coil ballistic galvanometer, a deflection of 30 mm is observed on a scale 1m away. Find the current sensitivity of the galvanometer (the free period of the coil is 10 seconds).
25. Explain the principle and working of Ammonia MASER.

26. Using Boolean algebraic techniques, simplify the following expression Y = AB + A(B+C) + B(B+C)
27. Draw the circuit diagram of an inverting amplifier and explain its operation.

SECTION – C

Answer any THREE question: (3 x15=45)

28. Apply Gauss's law to find the electric field intensity inside and outside a uniformly charged spherical sphere.
29. With a neat diagram, describe the magnetometer method of tracing hysteresis cure and explain the properties attained from it.
30. Elucidate the principle, construction and working of a moving coil ballistic galvanometer. Obtain an expression for current sensitivity and voltage sensitivity.
31. What is holography? Explain the construction and reconstruction of hologram with a neat diagram.
32. Explain how an operational amplifier can be used as (i) adder (ii) integrator and (iii) differentiator. Obtain expression for output in each case.

****