STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2015-16& thereafter)

SUBJECT CODE :15PH/AC/PH23

B.Sc. DEGREE EXAMINATION APRIL 2019
BRANCH III - PHYSICS
SECOND SEMESTER

COURSE : ALLIED – CORE
PAPER : PHYSICS - II
TIME : 3 HOURS **MAX. MARKS :100**

SECTION – A

ANSWER ALL QUESTIONS: **(30 x 1 = 30)**

I CHOOSE THE CORRECT ANSWER:

1. The electric potential at a point (x,y,z) is given by $V = -x^2y - xz^3 + 4$. The electric field $\vec{E}$ at that point is
   a) $\overrightarrow{E} = (2xy + z^3)\hat{\imath} + x^2\hat{\jmath} + 3xz^2\hat{k}$
   b) $\overrightarrow{E} = 2xy\,\hat{\imath} + (x^2 + y^2)\,\hat{\jmath} + (3xz - y^2)\hat{k}$
   c) $\overrightarrow{E} = z^3\,\hat{\imath} + xyz\hat{\jmath} + z^2\hat{k}$
   d) $\overrightarrow{E} = (2xy - z^3)\hat{\imath} + xy^2\hat{\jmath} + 3xz^2\hat{k}$

2. A capacitor stores 0.24 coulombs at 10 volts. Its capacitance is
   a) 0.024 F b) 41.667 F c) 2.4 F d) 4.1667 F

3. For making a capacitor, it is better to select a dielectric having
   a) low permittivity b) high permittivity
   c) permittivity same as that of air d) permittivity slightly more than that of air

4. According to Fleming's left hand rule, the thumb denotes
   a) Direction of magnetic field b) direction of current
   c) direction of force d) direction of force as well as current

5. The relation between the direction of current and the direction of force in a current carrying conductor is________________
   a) Same direction b) opposite direction
   c) perpendicular d) unrelated

6. When the length of the conductor in the current carrying conductor increases, what happens to the force in the conductor?
   a) Increases b) decreases
   c) remains the same d) becomes zero

7. A lens whose $\frac{R_1}{R_2} = -\frac{1}{6}$ is called a
   a) Concave lens b) convex lens
   c) crossed lens d) concave mirror

8. The shape factor q of a lens is given by
   a) $q = \frac{R_2 + R_1}{R_2 - R_1}$ b) $q = \frac{R_1}{R_2 - R_1}$
   c) $q = \frac{R_2 - R_1}{R_1 + R_2}$ d) $q = \frac{R_2 R_1}{R_1 + R_2}$

9. The angular magnification when the telescope is in normal adjustment is
   a) $\frac{f}{F}$ b) $\frac{F}{f}$
   b) c) $1 - \frac{F}{f}$ d) $1 + \frac{f}{F}$

10. The central spot of Newton's ring formed due to transmitted light is
    a) Bright b) dark
    c) dark for large wavelength d) bright for large wavelength

11. Two sources of light are coherent if they emit rays of
    a) Same wavelength
    b) same amplitude of vibration
    c) same wavelength with constant phase difference
    d) same amplitude and wavelength

12. In an interference pattern
    a) Bright fringes are wider than dark fringes
    b) Dark fringes are wider than bright fringes
    c) Both dark and bright fringes are of equal width
    d) Central fringes are brighter than the outer fringes

13. In the common mode, ___________
    a) Both inputs are grounded
    b) The outputs are connected together
    c) An identical signal appears on both the inputs
    d) The output signal is in phase

14. The OPAMP can amplify
    a) a.c signals only b) d.c signals only
    c) botha.c and d.c signals d) neither d.c nor a.c signals

15. A(A+B) = ?
    a) AB b) 1 c) 1+AB d) A

II. Fill in the blanks (5 Marks):

16. A dielectric material must be a ______________
17. Tesla is the unit of ____________
18. The aberrations produced by the variation of refractive index with wavelength of light are called ______________
19. When a plane polarised light is passed through an analyser and analyser is rotated through 90°, the intensity of the emerging light ______________
20. According to Boolean law: A+1 =___________

III. True or False (5 Marks):

21. Lines of force start from negative charges and terminate on positive charges.

22. The magnetic force imparts the energy of the field.

23..The image in an astronomical telescope is real, erect and magnified and hence it is suitable in astronomy.

24. Light waves can be polarised as they are longitudinal.

25. With zero volts on both inputs, an OPAMP ideally should have an output equal to CMRR.

IV. Answer Briefly (5 Marks):

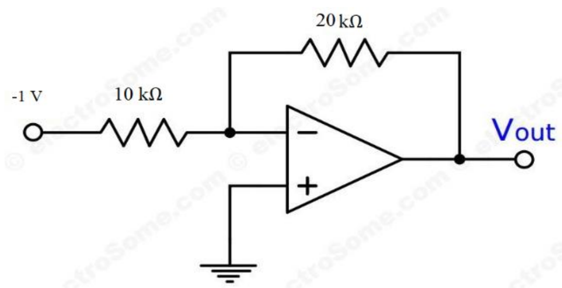
26. Give the S.I. unit for charge and electric field.

27. Define figure of merit of a moving coil galvanometer.

28. Two lenses of focal lengths 8 cm and 4 cm are placed at a certain distance apart. Calculate the distance between the lenses if they form an achromatic combination.

29. Mention any two uses of polaroids.

30. What is the output of the following circuit?



SECTION – B

ANSWER ANY FIVE QUESTIONS: (5 x 5 = 25)

31. Determine the capacity of a capacitor sepertated by a distance of 2 cms with area of c.s 5 sq.cm, a) without dielectric and b) when filled with amaterial of dielectric 7.

32. A test charge 1.6 x 10^{-19} C is moving with a velocity**v =** 3 x 10^{5} m/s in a magnetic field **B =** 1.5Wb/m^{2} and also moves in an electric field of strength 50kV. Find Lorentz force.

33. Calculate the focal lengths of a convex lens of crown glass (dispersive power 0.012) and a concave flint glass (dispersive power 0.020) so that when placed in contact they form an achromatic converging combination of focal length 30 cm.

34. Light of wavelength 5000 Å is incident normally on a plane transmission grating. Find the difference in the angles of deviation in the first and third order spectra. The number of lines per cm on the grating surface is 6000.

35. Discuss in detail how a single lens cannot form an image free from chromatic aberration.

36. Give the construction and working of Laurent's half shade polarimeter.

37. Find the complement of $(wx + \bar{y}z).\overline{(w\bar{x}y + \bar{w}z).(x + \overline{y+z})}$

SECTION – C

ANSWERANYTHREE QUESTIONS: (3 X 15 = 45)

38. State and prove Gauss's law in electrostatics.

39. Explain with a neat diagram the construction and working of a moving coil ballistic galvanometer. Derive an expression between the quantity of charge flowing through it and the throw obtained.

40. Obtain the condition for achromatism of two thin lenses separated by a finite distance.

41. Explain Newton's rings formed by reflected light and how it is used to determine the wavelength of monochromatic light?

42. With neat diagrams explain the working of OPAMP as
    a) a summing amplifier b) differentiator.