

SUBJECT CODE : 19PH/AC/PM23
B.Sc. DEGREE EXAMINATION APRIL 2023
BRANCH I - MATHEMATICS
SECOND SEMESTER

COURSE : ALLIED – CORE
PAPER : PHYSICS FOR MATHEMATICS - II
TIME : 3 HOURS

MAX. MARKS : 100

SECTION – A

ANSWER ALL QUESTIONS:

I CHOOSE THE CORRECT ANSWER:

(10 x 1 = 10)

- Force of attraction between two charges separated by a distance r in the presence of dielectric medium (K dielectric constant)
(a) remains unchanged (b) decreases K times (c) increases K times (d) increases K^2 times
- Due to dielectric medium, the capacitance of a capacitor is found to be
(a) increased (b) zero (c) decreased (d) constant
- If the direction of velocity of moving charge is parallel to the direction of applied magnetic field, then the path of charged particle is a
(a) straight line path (b) circular path (c) helical path (d) elliptical path
- If unit current passes through a parallel current carrying conductors separated by a unit distance, then the magnetic force per unit length is
(a) zero (b) 1 N/m (c) equivalent to the value of μ_0 (d) 2 N/m
- Chromatic aberrations of a lens can be reduced by
(a) polishing the surface (b) A chromatic combinations of two lenses in contact
(c) reducing aperture (d) varying the radius of curvature
- Magnifying power m of a telescope is given by
(a) $m = \text{Focal Length of Objective lens} / \text{Focal Length of eyepiece}$
(b) $m = \text{Focal Length of eyepiece} / \text{Focal Length of Objective lens}$
(c) $m = 1 / \text{Focal Length of Objective lens}$
(d) $m = 1 / \text{Focal Length of eyepiece}$
- Interference occurs due to superposition of
(a) two coherent light waves (b) two incoherent light waves
(c) two lenses (d) two light sources at different positions.
- Refractive index of Ordinary ray in double refraction phenomenon is
(a) varying with angle of incidence (b) constant
(c) zero (d) varying with angle of refraction

9. If a capacitor is included in the feedback path of an Op-Amp circuit, then the circuit can act as _____
 (a) multiplier (b) integrator (c) adder (d) subtractor
10. According to De Morgan's theorem NAND gate is
 (a) Bubbled OR gate (b) Bubbled AND gate (c) AND gate (d) OR gate

II FILL IN THE BLANKS:**(5 x 1 = 5)**

11. According to conservation charges the number of charges entering the body is _____ to the number of charges leaving the body.
12. Direction of force (**F**) is _____ to the direction of **v** and **B**
13. In the reflecting telescope _____ mirror is used as an objective
14. In the polarized light the plane of vibration is _____ to the direction of propagation
15. If the gain of an inverting amplifier is 5 with an input resistance of 2Ω , then the value of feedback resistor is _____

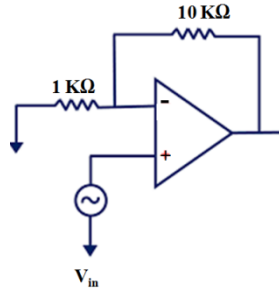
III ANSWER BRIEFLY ALL THE QUESTIONS:**(5 X 2 = 10)**

16. Mention any two differences between refraction and diffraction
17. Write down the Maxwell's Electromagnetic Equations in free space.
18. What do you mean by defects of images?
19. What is optical activity?
20. What is CMRR?

SECTION B**ANSWER ANY FIVE QUESTIONS****(5 X 6 = 30)**

21. Show that Gravitational force is negligible as compared to electric force in hydrogen atom in which the electron and proton are about 5.3×10^{-11} m apart. (**Given mass of electron = 9.1×10^{-31} kg, mass of proton = 1.6×10^{-27} Kg, $G = 6.67 \times 10^{-11}$ N-m²/Kg²**)
22. A uniform magnetic field of 6.5×10^{-4} T is maintained in a chamber. An electron is shot into the field with a speed of 4.8×10^{-6} ms⁻¹ normal to the field. Explain why the path of the electron is a circle. Determine the radius of the circular orbit.
(charge of electron is 1.6×10^{-19} C, mass of electron = 9.1×10^{-31} Kg).
23. Derive the electric field at a point due to a point charge using gauss law.
24. Explain the Normal incidence experiment using grating to determine the wavelength of light.
25. Simplify using K Map $Y=F(A,B,C)=\sum (1,2,3,5,7)$

26. For the non-inverting amplifier circuit shown below, find the output voltage for the input voltage (a) 1 V and (b) -1 V.



27. An astronomical telescope has an angular magnification of magnitude 5 for distant objects. The separation distance between the objective and an eye piece is 36 cm and the final image is formed at infinity. Calculate the focal length of the objective lens and eyepiece.

SECTION C

ANSWER ANY THREE QUESTIONS

(3 X 15 = 45)

28. What are Monochromatic aberrations? How can they be minimized?
29. Explain the principle of a moving coil ballistic galvanometer with necessary theory.
30. Explain with the reflecting telescope with suitable ray diagram and write its magnifying power.
31. What is double refraction? Explain the construction and working of a Nicol prism and mention its uses.
32. Derive the expressions for voltage gain of (i) inverting and (ii) non-inverting amplifier.
