SUBJECT CODE : 19PH/AC/PM23
B.Sc. DEGREE EXAMINATION APRIL 2022
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)**

1. The work done per unit charge is _____
   a) electric field   b) electric force   c) electric potential   d) electric strength

2. Magnetic field is not associated with _____
   a) charge in uniform motion   b) an accelerated charge
   c) a stationary charge   d) a decelerated charge

3. A 300 mm long conductor is carrying a current of 10 A and is situated at right angles to a magnetic field having a flux density of 0.8 T ; the force on the conductor will be
   (a) 240N   (b) 24N   (c) 2.4N   (d) 0.24N

4. The aberration produced by variation of μ with λ is called _____ aberration
   a) Spherical   b) comatic   c) chromatic   d) On axis

5. If a monochromatic light is used, the center of the Newton's rings is
   a) bright   b) dark   c) neither dark not bright   d) red in color

6. In Newton's Rings, with increase in the order of the fringes the width of the fringes,
   a) decreases   b) increases   c) no change   d)remains constant

7. An example of uniaxial crystal is
   a) quartz   b) calcite   c) both   d)carbon

8. The angular magnification when the telescope is in normal adjustment is _____ when f and F are focal lengths of objective and eyepiece respectively.
   a) f/F   b) F/f   c) 1+ f/F   d)1 + F/f

9. A virtual ground has
   a. zero voltage and infinite current   b. zero voltage and zero current
   c. infinite voltage and zero current   d. Infinite voltage and infinite current

10. The solution for the Boolean expression $A + \bar{A}B$ is_____
    (a) A.B   (b) A+B   (c) Ā.B   (d) B

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

11. If the distance between two charges is doubled the electro static force between them will be _____

12. Constructive interference occurs, when the path difference of the rays is _____.

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

14. Light transmitted by a single Nicol crystal is _____

15. Op amp voltage follower circuit is used as _____

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

16. What is Lorentz force? Brief on each term in the relation

17. What is chromatic aberration? Give diagram

18. Differentiate between Fresnel and Fraunhofer diffraction

19. What is optical activity?

20. Simplify $(A+C)(A+B)$

SECTION B

ANSWER ANY FIVE QUESTIONS   (5 X 6 = 30)

21. Determine the capacity of a capacitor separated by a distance of 2 cms with area of Cross section 5 sq.cm, a) without dielectric and b) when filled with a material of dielectric 7.

22. Differentiate Interference and Diffraction b)A parallel beam of light falls normally on a diffraction grating ruled 4x105 lines/m and the second order image is diffracted 34o from the normal. Calculate the wavelength of the light.

23. What is the condition for keeping two lenses in contact to be an achromat? Use the relation to solve: The focal length of achromatic combination of two lenses in contact is 150 cm. If the dispersive powers of the materials of the two lenses are .018 and .027, calculate the focal length of two lenses.

24. How will you detect the nature of polarization using analyzer? What is the output from the analyzer if unpolarized light is incident on it and different types of polarized beams are incident?

25. Explain how the refractive index of liquid can be determined by forming Newton's rings.

26. Draw an amplifier circuit to give a voltage gain of 10 using Op amp used in a) Inverting mode b) Non-inverting mode of operation.

27. Simplify   i) $AB+A(B+C)+B(B+C)$ ii) $(\bar{A} + B).(A + B)$

SECTION C

ANSWER ANY THREE QUESTIONS   (3 X 15 = 45)

28. a) What is Spherical aberration? Give ray diagram and describe the methods to minimize it?
    b) What is Chromatic aberration? Obtain the condition for a pair of lenses in contact to be an achromatic doublet.

29. a) Derive relation to determine the capacity of a capacitor a) without dielectric and b) when filled with a material of dielectric.   b) List Maxwell's equations with significance

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30. Discuss the theory of plane diffraction grating and describe an experiment to determine the wavelength of a given source of light using a plane transmission grating

31. Draw circuit diagram of Non-inverting, Subtractor and Integrator circuits using Op-amp and explain their working.

32. Solve using Karnaugh map simplification

a) $Y = \sum(4,5,6,7,10,11,14,15)$

b) $Y = \bar{A}\,\bar{B}\,\bar{C} + \bar{A}\,B\,\bar{C} + A\bar{B}\,\bar{C} + A\,\bar{B}\,C + AB\,\bar{C} + ABC$

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