Q.P. Code – 50721

Second Year B.Sc. Degree Examination, OCTOBER/NOVEMBER 2016

(Directorate of Distance Education)

Physics

(DSB 210) Paper II – SOUND, OPTICS, ELECTRICITY AND ELECTROMAGNETISM

Time : 3 Hours] *[Max. Marks : 75/85*

Instructions to Candidates :

1) *Students who have attended **25** marks **I-A** Scheme will have to answer for total of **75** marks.*
2) *Students who have attended **15** marks **I-A** Scheme will have to answer for total of **85** marks.*
3) *Section **E** is **compulsory** for **85**-marks scheme only.*

SECTION – A

I. Answer ALL questions : **10 × 1 = 10**

1. State Stoke's theorem.
2. Define the time constant of RC circuit.
3. What is the Q value of a resonant circuit?
4. Write the expression for velocity of electromagnetic waves in a free space.
5. State Brewster's law.
6. What is meant by half period zone?
7. What are coherent sources?
8. Why thunder is heard after seeing the flash of lightening?
9. What is the main cause of damping in B.G.?
10. Define reactance of an inductor.

SECTION – B

II. Answer any FIVE Questions : **5 × 3 = 15**

11. Derive the differential equation of one dimensional progressive wave.
12. Explain the reflection of a spherical wave front at a plane surface.

13. Derive Maxwell's equation $\vec{\nabla} \times \vec{H} = \vec{J}$ using Ampere's circuital law.

14. Explain (a) curl of a gradient is always zero and (b) divergence of a curl is always zero.

15. The polarizing angle for a glass is 57°24'. Calculate the refractive index for glass.

16. Describe the Fresnel biprism method for the determination of wavelength of light.

17. Distinguish between Huygen's eye piece and Ramsden's eye piece.

SECTION – C

III. Answer any FIVE Questions : **5 × 6 = 30**

18. Derive an expression for current and impedance in an LCR series circuit fed with alternating e.m.f. by '*j*' operator method.

19. State and prove Maximum power transfer theorem for DC circuits.

20. What is peak inverse voltage? Describe the working of full wave rectifier using centre tap transformer.

21. Give the theory of Ballistic Galvanometer.

22. State Ampere's circuital law. Use this law to find the magnetic field at the axis of a long solenoid having '*n*' turns per unit length and carrying a current '*I*'.

23. Give the theory of Zone plate.

24. What is forced oscillation? Derive the differential equation for forced oscillation.

SECTION – D

IV. Answer any TWO Questions : **2 × 10 = 20**

25. (a) What are beats? Discuss the theory of beats.

    (b) Shock absorber of a car of mass 1000 kg sinks through 2.8 cm when a person of 980 N sits in car. When car hits a hump, it oscillates in SHM. Find frequency of SHM. **6 + 4**

26. (a) Give the theory of interference of light in thin films considering the reflected rays.

    (b) The distance between the two coherent sources in 1 mm and the screen in 1 m away from the sources. The second dark band is 0.1 sm from the central bright fringe. Find the distance of the second bright fringe from the central bright fringe. **6 + 4**

27. (a) Give the Huygen's theory of double refraction.

    (b) A uniform magnetic field of magnitude 1.5 Weber per meter square, points horizontally. A proton of energy 5 MeV moves vertically downwards through this field. Calculate the force on it. **6 + 4**

28. (a) Write down Maxwell's field equations and deduce the electromagnetic wave equation there from.

    (b) The transformer used in the half wave rectifier has a turn ratio of 20 : 1. The primary of the transformer is connected to AC main of 240 V. Assuming forward diode resistance to zero, calculate the DC voltage across the load. **6 + 4**

SECTION – E

V. Answer any ONE of the following questions : 1 × 10 = 10

(**Compulsory** Question for **85** marks scheme only)

29. (a) Give the theory of Newton's Rings.

    (b) The average power radiated by a broadcasting station is 8 kW. Assume the power to be radiated over the surface of a hemisphere of radius 10 km with the station at its centre. Calculate the magnitude of the Poynting vector on the surface of the hemisphere. **6 + 4**

30. (a) Discuss the theory of diffraction of light by plane transmission grating for normal incidence.

    (b) If a potential function $\vec{V} = -\beta xy$, obtain the value of electric field where β is a constant. **6 + 4**

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