

**Second Year B.Sc., Degree Examinations****September /October 2015***(Directorate of Distance Education.)***PHYSICS****DSB 210 : Paper II : Sound, Optics, Electricity and Electromagnetism***Time: 3 hrs.]**[Max.Marks:75/85*

- Instructions :*
- 1. Students who have attended 25 Marks IA Scheme will have to answer for total of 75 Marks.*
  - 2. Students who have attended 15 Marks IA 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.****(10X1=10)**

1. State Gauss' divergence theorem.
2. Define intensity of a progressive wave.
3. Define vector field.
4. State ampere circuital law.
5. Give an example for a doubly refracting crystal.
6. What is the main cause of damping in a B.G.?
7. Define Q-factor of a resonant circuit.
8. What is the value of ripple factor of a full wave rectifier for a sinusoidal input?
9. Expand CRO.
10. State Poynting theorem.

**SECTION - B****II. Answer any FIVE questions.****(5X3=15)**

11. What is forced oscillation? Set up the corresponding differential equation.
12. Mention the characteristics of a progressive wave.
13. In an experiment with a Michelson's interferometer, the distance travelled by the mirror for two successive positions of maximum distinctness was 0.2945mm. If the mean wavelength for the two components of sodium D line is 5893 Å. Calculate the difference between them.
14. Briefly explain the Huygen's principle of secondary wavelets.

*Contd...2*

15. Write down Maxwell's field equations. Deduce the II equation.
16. What are frequency filters? With a circuit diagram explain the action of a Band pass filter.
17. A circular coil of 50 turns and radius of 5 cm is held in a uniform magnetic field of 0.04 tesla with its plane inclined at  $30^\circ$  to the magnetic field. If the current passing through the coil is 1 A, calculate magnetic moment of the coil and magnitude of torque on it.

### SECTION - C

III. Answer any FIVE questions. (5X6=30)

18. What are beats? Discuss the theory of beats.
19. Explain the production and detection of linearly, elliptically and circularly polarized light.
20. Define wave velocity and group velocity and derive the relation between them. When the two velocities become equal?
21. Describe Hertz experiment of production and detection of electromagnetic wave.
22. Discuss the theory of diffraction of light by a plane transmission grating for normal incidence.
23. Explain the construction and working of half-wave and full wave rectifiers.
24. Deduce the expression for self inductance of a coil using Anderson's bridge.

### SECTION - D

IV. Answer any TWO questions. (2X10=20)

25. a) Derive the expression for velocity of sound waves in a rod.  
 b) A body having the mass of 4 kg executes SHM. The force acting on the body when the displacement 0.08 m is 0.239N. Find the time period. If the maximum velocity is  $0.5 \text{ m}^{-1} \text{ s}$ , Find the amplitude and maximum acceleration. (7-3)
26. a) What is an eye piece? Explain the construction and working of Huygen's eyepiece.  
 b) If earth receives  $1400 \text{ Wm}^{-2}$  solar energy, what are the amplitudes of electric and magnetic fields of the radiation? (5+5)
27. a) Give the theory of interference of light in thin films considering the reflected rays.  
 b) Show that  $\text{Curlgrad } \phi = 0$ . where  $\phi$  is a scalar field. (7+3)

*Contd...3*

28. a) Using 'j' operator method arrive at an expression for the instantaneous current and resonant frequency in a series LCR circuit fed with a sinusoidal voltage.
- b) A coil has a resistance of  $100\Omega$  and an inductance of 0.5 H. Calculate the current in the circuit when it is connected to an AC source of 220V and 50Hz.

(7+3)

**SECTION - E**

- V. Answer any ONE of the following questions. (1X10=10)  
(Compulsory question for 85 marks scheme only)

29. a) Give the theory of zone plate.
- b) State and prove the maximum power transfer theorem for a DC circuit. (6+4)
30. a) Give the theory of Newton's rings.
- b) Define divergence and curl of a vector field and mention their physical significance. (6+4)

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