DSB – 210

II Year B.Sc. Examination, Sept./Oct. 2012
(Directorate of Distance Education)
PHYSICS (Paper – II)
Sound, Optics, Electricity and Electromagnetism

Time : 3 Hours   Max. Marks : 75/85

Instructions : 1) Students who have attended **25 Marks IA Scheme** will have
                            to answer for a total of **75** Marks.
                        2) Students who have attended **15 Marks IA Scheme** will have
                            to answer for a total of **85** Marks.
                        3) Section **E** is **compulsory** for **85** Marks **scheme only**.

SECTION – A

I. Answer **ALL** questions.   **(10×1=10)**

    1) Give any one application of beats.

    2) What is the effect of humidity on the velocity of sound in air ?

    3) Why thin films appear colored in white light ?

    4) Mention the condition for occurrence of diffraction of light.

    5) What do you mean by double refraction ?

    6) Define charge sensitiveness of a ballistic galvanometer.

    7) Define bandwidth, of a series resonant circuit.

    8) Define ripple factor of a rectifier circuit.

    9) Mention any one use of cathode ray oscilloscope.

    10) Define Poynting vector.

SECTION – B

II. Answer any **FIVE** questions.   **(5×3=15)**

    11) What is damped oscillation ? Set up the corresponding differential equation.

    12) Write down the equation for one dimensional progressive wave and define
        the terms in it.

    13) Two glass plates enclose a wedge shaped air-film touching at one edge and
        are separated by a thin wire of 0.05 mm diameter at a distance of 0.25 m
        from the edge. Calculate the fringe width if the wavelength of light used is
        6000Å .

                                                                                    P.T.O.

14) What are positive and negative crystals ? Give one example for each.

15) A condenser of capacity $0.5 \mu F$ is connected in series with a resistance to a 220 V, 50 Hz ac supply. If the potential difference across the condenser and resistance are equal in magnitude, calculate the value of resistance.

16) What is a low pass filter ? Explain the action of a low pass RC filter.

17) A de Sauty's bridge is constructed using resistances 250Ω and 500Ω, and capacitances $1 \mu F$ and $C \mu F$. Calculate the possible values of the capacitance C needed to balance the bridge.

SECTION – C

III. Answer any **FIVE** questions. **(5×6=30)**

18) Give the theory of Lissajous figures for the special cases of straight line and circle.

19) Deduce Snell's law of refraction of light using Huygen's wave theory.

20) Explain the construction of Michelson's interferometer and mention the conditions for the occurrence of straight, curved and circular fringes.

21) Define dispersive power and resolving power of a grating and mention the factors on which they depend. Deduce the expression for dispersive power of a plane transmission grating.

22) State Ampere's circuital law and apply it to determine the magnetic field inside a long solenoid carrying current.

23) Derive the expression for efficiency of a full wave rectifier.

24) Give the theory of Ballistic galvanometer.

SECTION – D

IV. Answer any **TWO** questions. **(2×10=20)**

25) a) Derive the expression for velocity of transverse waves in a stretched string.

   b) What are forced oscillations ? Write the expressions for frequency and amplitude of a forced oscillator at resonance. **(7+3)**

26) a) Explain chromatic and spherical aberrations with neat diagrams.

   b) Derive the condition for achromatization of two thin lenses placed in contact. **(4+6)**

27) a) With a neat labelled diagram explain the construction of half period zones for a plane wave front and prove that the area of nth half period zone is independent of the order 'n'.

b) Give the theory of Fraunhofer diffraction at a single slit. **(4+6)**

28) a) Define divergence of a vector field and give its physical meaning.

b) Write down Maxwell's field equations in free space and deduce the wave equation for field vectors. Hence prove that light is an electromagnetic wave. **(2+8)**

SECTION – E

V. Answer any **ONE** of the following questions. **(1×10=10)**

(**Compulsory** question for **85** Marks **scheme only**)

29) a) Using 'j' operator method arrive at an expression for the instantaneous current in a series CR circuit fed with a sinusoidal voltage. Draw the wave forms of the ac voltage appearing across the capacitor C and resistor R.

b) State and illustrate the maximum power transfer theorem for a DC circuit. **(8+2)**

30) a) Explain the procedure for the detection of linearly, circularly and elliptically polarized light.

b) Write short notes on optical activity and Kerr effect. **(6+4)**