Q.P. Code – 50721

Second Year B.Sc. Degree Examination

SEPTEMBER/OCTOBER 2013

(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 a total of* ***75*** *marks.*

2) *Students who have attended* ***15*** *marks* ***I-A*** *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. By what method interference is obtained in case of air wedge?

2. What are half power frequencies?

3. What are half period zones?

4. Define charge sensitivity of B.G.

5. Define Poynting vector.

6. What is the condition for achromatisation of two thin lenses not in contact?

7. Define dispersive power of a grating.

8. Which type of eyepiece is used in a laboratory travelling microscope?

9. Define Kerr effect.

10. What kind of lens has to be used in Newton's rings?

SECTION – B

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

11. What are Lissajous figures? Write the shape of Lissajous figures when two simple harmonic motion's of same period overlap with a phase of (a) $\pi/2$ (b) π.

12. What are free, damped and forced vibrations?

13. Distinguish between Fresnel and Fraunhoffer diffraction.

14. Derive an expression for R.M.S. value of AC.

15. Show that div grad $\phi = \nabla^2\phi$.

16. What is high pass filter? Explain the action of high pass RC filter.

17. Describe the Hertz experiment for the production of electromagnetic waves.

SECTION – C

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

18. Give the theory of Newton's rings due to reflected light.

19. What is plane transmission grating? Give its theory for normal incidence.

20. What is polarisation? How are circularly and elliptically polarised light produced? Explain.

21. Derive Newton's formula for the velocity of sound through a gaseous medium.

22. With a neat diagram, explain the working of full wave bridge rectifier and write the expression for ripple factor.

23. State Ampere's circuital law and discuss its application to a solenoid.

24. Explain with necessary diagram the construction and uses of a CRO.

SECTION – D

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

25. (a) Give the theory of diffraction at a straight edge and show that the bands produced are not equally spaced.

(b) Calculate the number of lines per meter in a grating of width 3 cm which will just resolve the sodium lines in the second order given the wavelengths of sodium lines to be 5890 Å and 5896 Å. **6 + 4**

26. (a) Derive an expression for the amplitude of the current in series LCR circuit fed with an alternating emf using j – notations. Discuss the condition of resonance.

(b) The resistor, capacitor and inductor of values 100 Ω, 1 μF and 2 Henry respectively are in series. The combination is fed with $\left(100\sqrt{2}\right)\sin 1000t$ volts a.c. Find the potential difference across the inductor. **6 + 4**

27. (a) What is an eyepiece? Give the theory and construction of Ramsden's Eyepiece.

(b) The dispersive powers for crown and flint glass are 0.015 and 0.030 respectively. Calculate the focal lengths of the lenses which form an achromatic doublet of focal length 60 cm when placed in contact. **6 + 4**

28. (a) Write Maxwell's equations for free space and hence derive the expression for velocity of Electromagnetic wave in free space.

(b) Estimate the value of permittivity of free space from the Knowledge of velocity of Electromagnetic wave in free space. $\mu_0 = 4\pi \times 10^{-7}$ H/m. **7 + 3**

SECTION – E

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

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

29. (a) Describe the principle, construction and working of Michelson interferometer with a neat diagram.

(b) Write note on interference filters. **8 + 2**

30. (a) Give the Fresnel's theory of rotation of plane of polarisation.

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