

Roll No.

OLE-3056

B. Tech. 3rd Semester (ME) Examination – April, 2021

PHYSICS - II (Optics & Waves)

Paper : BSC-ME-201-G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) Determine the average power dissipation during one time period for damped oscillator.
- (b) Discuss Unit plane.
- (c) Write expression for width of central maxima in diffraction pattern obtained due to single slit ? On what factors does it depend ?

- (d) Discuss dead beat galvanometer.
- (e) Discuss significance of standing wave ratio.
- (f) Explain group velocity and phase velocity.

$$2.5 \times 6 = 15$$

UNIT – I

- 2. Define forced harmonic oscillations. Derive its differential equation and discuss condition of resonance. Show that frequency of harmonic oscillator is not affected by damping, if Q value is very high. 15
- 3. Explain following :
 - (a) Transient and steady state behavior of forced oscillator 5
 - (b) Sharpness of Resonance 5
 - (c) Quality factor of damped oscillator 5

UNIT – II

- 4. Derive Fresnel's Equation for different polarizations. 15
- 5. (a) Derive Laws of reflection using Fermat's principle. 8
- (b) Deduce expression for velocity of longitudinal sound waves propagating in solid. 7

UNIT – III

6. (a) Explain the formation of Newton's Ring in reflected light. Why does the centre of Newton's ring appear dark ? Derive expression for the diameter of n^{th} dark ring in reflected light. 9
- (b) In Newton's ring experiment, the radius of curvature of lens is 5m and its diameter is 20 mm. Assume $\lambda = 589 \text{ nm}$ 3
- (i) How many bright rings are produced ?
- (ii) How many bright rings will be produced if the arrangement is immersed in water ($\mu = 1.33$) ?
- (c) What are coherent sources? How they are realized in practice ? 3
7. (a) Define plane transmission grating. Derive expression for the intensity distribution and condition for principal maxima, secondary maxima and minima. 12
- (b) A source containing a mixture of hydrogen and deuterium atoms emits red light at two wavelengths whose mean is 656.3 and whose separation is 0.18 nm. Find the minimum number of lines needed in diffraction grating that can resolve these lines in first order. 3

UNIT – IV

8. (a) What are three and four level lasers? Discuss with suitable diagram principle, construction and working of He-Ne Laser. 12
- (b) Discuss necessary conditions for lasing action. 3
9. (a) Discuss in detail characteristics of Laser beam. 8
- (b) What are Einstein's coefficients ? Derive Einstein relations. 7
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