

UNIT – IV

8. Explain the terms stimulated emission of radiation and optical pumping. Explain how lasers can be produced He-Ne gas. How it is superior to Ruby Laser ? 15
9. What do you understand by solid state laser ? Describe the principle of laser action. What are necessary condition for laser action ? Give main component of a Ruby and He-Ne laser. 15

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Roll No.

3056

B. Tech. 3rd Semester (ME)
Examination – March, 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, selecting *one* question from each Unit and Question No. 1 is *compulsory*.

1. Explain the following : 2.5 × 6 = 15
- (a) Write a short note on forced oscillation.
- (b) Why matrix method is superior to old conventional method to find the position of the image in an optical system ?
- (c) Discuss the applications of Michelson Interferometer.

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- (d) Discuss monochromacity, directionality and coherence in reference to laser.
- (e) For an ordinary source, the coherence time is 10^{-8} sec. Obtain the degree of non-monochromacity for $\lambda_0 = 5700 \text{ \AA}$.
- (f) What do you mean by reflectance and transmittance?

UNIT - I

- 2. Define damped harmonic oscillations. Write differential equation for a damped harmonic oscillator. Solve the differential equation and discuss specially the case of oscillatory motion. 15

- 3. Establish the differential equation for forced harmonic oscillator and discuss the condition for resonant amplitude. Show the dependence of the amplitude as a function of driving frequency.

UNIT - II

- 4. (a) Define unit plane and nodal plane and find an expression for unit plane. 10
- (b) What are sinusoidal waves? What are its types? 5

- 5. (a) Explain Fermat's principle and Brewster's angle. 5
- (b) Find an expression for traverse vibration of string. 10

UNIT - III

- 6. (a) Derive an expression for the radius of a dark ring in Newton's ring formed by reflected light. Explain how the refractive index of a transparent liquid can be determined using Newton's rings? 10

- (b) A parallel beam of sodium light ($\lambda = 5890 \text{ \AA}$) strike the film of oil floating on water. When viewed at an angle of 30° from the normal, 8th dark band is seen. What is film thickness? ($\mu_{oil} = 1.5$). 5

- 7. (a) What is plane transmission diffraction grating? Explain how a chromatic beam gets dispersed while passing through it. Derive an expression for the dispersive power. 12

- (b) What is highest order spectrum which may be seen with monochromatic light of wavelength 6000 \AA by means of a diffraction grating with 5000 lines/cm ? 3