

Roll No. ....

**3056**

**B. Tech 3rd Semester (ME)  
Examination – December, 2019**

**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
- (a) What is meant by resonance and quality factor ?
  - (b) What are nodal planes and nodal points ? Can nodal plane coincides with unit planes ?
  - (c) Why there is need of extended source in the interference by division of amplitude ?
  - (d) Derive the relation between Einstein coefficients.

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- (e) Prove that when damping forces are present, the frequency of an oscillator is reduced by  $12.5/Q^2$  percent where  $Q$  is Quality factor.
- (f) Explain dispersive and resolving power.

#### UNIT - I

2. 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. 15
3. Define damped harmonic oscillations and write it differential equation. Show amplitude of weak damped oscillation decays exponentially with time. 15

#### UNIT - II

4. Write a short note on following :
- (a) Fresnel equations 8
- (b) Fermat's principle and its applications 7
5. (a) Derive an expression for longitudinal sound wave in solid. 10
- (b) Write a short note on nodal plane. 5

#### UNIT - III

6. (a) Explain the working of Michelson interferometer. How will you produce circular fringes with ? 10

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- (b) How will you measure the difference in wavelength between D lines of sodium light ? 5

7. (a) Differentiate between Fraunhofer and Fresnel diffraction. Explain the phenomenon of diffraction through a single slit. 12
- (b) Explain Rayleigh's criterion of resolution. 3

#### UNIT - IV

8. (a) What do you understand by solid state laser ? Describe the principle, construction and working of Ruby laser. 10
- (b) A certain ruby laser emits 100 J pulses of light whose wavelength is  $6940\text{\AA}$ . What is the minimum number of  $\text{Cr}^{3+}$  ions in the ruby ? 05
9. (a) Explain laser action and give characteristics of a laser beam. Enlist the names of various lasers in use and discuss any one of them. 12
- (b) Calculate the coherence length for a laser beam for which the band width is  $\Delta\nu = 300\text{ Hz}$ . 3

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