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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.

(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

(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 6940Å. What is the minimum number of 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 $\Delta v = 300$ Hz. 3

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