Code No. : 11026 S(A)

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
B.E. (CBCS) I-Semester Supplementary Examinations, June/July-2019

Oscillations, Waves and Optics
(Civil & Mech. Engg.)

Time: 3 hours

Max. Marks: 60

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. Define logarithmic decrement and relaxation time.

2. Smaller is the damping, sharper is the resonance. Justify.

3. The fundamental frequency of vibration of a stretched string of length of 1 m is 256 Hz. Find the frequency of the same string of half the original length under identical conditions.

4. Explain the term 'wave groups'.

5. Briefly discuss Kundt's tube method to detect ultrasonic waves.

6. Ultrasonic waves are useful in medical diagnosis. Explain.

7. What is your observation with respect to the rings pattern when you perform Newton's rings experiment with white light?

8. A glass plate of refractive index of 1.54 is used as a polarizer. Find the angle of polarization and angle of refraction.

9. Electromagnetic waves are transverse in nature. Justify.

10. Define Poynting vector.

Part-B (5 × 8 = 40 Marks)

11. a) Derive an expression for the total energy of a simple harmonic oscillator. [5]

    b) Find the displacement at which kinetic energy and potential energy are equal in case of a simple harmonic oscillator. [3]

12. a) Obtain the differential equation for a transverse wave on a string. [5]

    b) A flexible string of length of 1 m and mass of 1 gr is stretched to a tension T. The string is found to vibrate in three segments at a frequency of 612 Hz. Calculate the tension in the string. [3]

13. a) Describe the production of ultrasonic waves by magnetostriction method. [5]

    b) Calculate the capacitance to produce ultrasonic waves of 10^6 Hz with an inductance of 1 henry. [3]

14. a) Derive the expression for wave length of light by using Newton's Rings Experiment. [5]

    b) A parallel beam of sodium light is incident normally on a plane transmission grating which has 4250 lines/cm and a second order spectral line is observed to be deviated through 30°. Find the wavelength of the light incident. [3]

15. a) Obtain an expression for electromagnetic wave in free space. [5]

    b) If the magnitude of H a plane electromagnetic wave is 1 amp-turn/m, find the magnitude of E in the free space. [3]

16. a) Find the resultant vibration when two mutually perpendicular SHMs of same amplitude and same frequency differing in phase by $90°$. [4]

   b) Explain reflection and transmission of acoustic waves. [4]

17. Answer any *two* of the following:

   a) Describe acoustic grating method to determine the velocity of ultrasonic waves in a liquid. [4]

   b) State and explain Malus's law. [4]

   c) Write Maxwell's electromagnetic wave equations in integral and differential forms. [4]

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