Total No. of Pages : 02

Total No. of Questions : 09

# B.Sc. (Non-Medical) (Sem.-4) WAVES & VIBRATIONS Subject Code : BSNM-403-18 M.Code : 77681 Date of Examination : 17-12-22

Time: 3 Hrs.

Max. Marks : 50

#### **INSTRUCTIONS TO CANDIDATES :**

- 1. SECTION-A is COMPULSORY consisting of TEN questions carrying ONE marks each.
- 2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

## **SECTION-A**

- 1. Write briefly :
  - a) A particle executes simple harmonic motion of period 10 seconds and amplitude 5 cm calculate the maximum amplitude of velocity.
  - b) How logarithmic decrement is related to damping coefficient of a damped oscillator?
  - c) What do you mean by electromagnetic damping?
  - d) Show that the displacement resonance occurs at a frequency slightly less than the frequency of velocity resonance.
  - e) What is the physical significance of mechanical impedance of a forced oscillator?
  - f) Discuss the term 'nuclear magnetic resonance'.
  - g) What determines the number of modes of a system of coupled oscillator?
  - h) State the characteristics of a progressive wave.
  - i) What do you mean by characteristic impedance of a string?
  - j) Two electric transmission cables are joined at a point. What special care should be taken for proper transmission of power?

## **SECTION-B**

- 2. What is torsional pendulum? Derive an expression for its time period.
- 3. A capacitor of  $1\mu$ F, an inductance of 0.2 Henry and a resistance of 800 ohms are connected in series. Is the circuit oscillatory? If yes, calculate the frequency and quality factor of the circuit.
- 4. Derive an expression for the velocity amplitude of a forced oscillator. Discuss the variation of phase difference between velocity and driving force frequency.
- 5. Give the characteristics of the in-phase and out of phase mode of vibrations of two identical coupled oscillators.
- 6. Define the terms wave velocity and group velocity. Find a relation connecting the two.

#### **SECTION-C**

- 7. Derive the differential equation of motion for a damped harmonic oscillator and obtain an expression for displacement. Discuss the case of light damping.
- 8. Derive an expression for the average power supplied to a forced oscillator in the steady state by an external driving force  $F = F_0 \cos \omega t$ .
- 9. Explain transfer of energy between two resistance free electric circuits which are inductively coupled. When is the coupling loose or tight? Obtain an expression for the normal mode frequencies and show that they are almost equal for loose coupling.

# NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.