

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

**B.Tech.(ME) (Sem-7,8)**  
**MECHANICAL VIBRATIONS**

Subject Code : BTME-701-18

M.Code : 90474

Date of Examination : 05-06-2023

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTIONS TO CANDIDATES :**

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO 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) What is harmonic motion?
- b) What do you know about 'beat phenomenon'?
- c) What is the significance of critical damping?
- d) A single degree freedom system consists of a mass and two springs  $K_1$  and  $K_2$  attached to it on two opposite sides. What will be its effective spring constant?
- e) In a forced vibration system with damping, where the external excitation is the harmonic base excitation, at which condition the maximum amplitude will occur?
- f) What is principle of Mode of vibration?
- g) What do you know about double pendulum?
- h) What is influence coefficient?
- i) What is secondary critical speed?
- j) What is the range of natural frequency of an accelerometer?

### SECTION-B

2. An accelerometer fixed on a machine shows a maximum acceleration of 62 g. A stroboscope shows its frequency as 5 Hz. Assuming a simple harmonic motion, determine the amplitude of vibration and maximum velocity.
3. A car having a mass of 1000 kg deflects its springs 4 cm under its load. Determine the natural frequency of the car in vertical direction.
4. The support of a spring-mass system is vibrating with amplitude of 5 mm and a frequency of 1150 cycle/min. If the mass is 0.9 kg and the spring has a stiffness of 1960 N/m, determine the amplitude of vibration of the mass. What amplitude will result if damping factor of 0.2 is included in the system?
5. Explain about reciprocal theorem, in detail.
6. Write a short note on Dunkerely's method

### SECTION-C

7. Three rail bogies are connected by springs of stiffness  $40 \times 10^5$  N/m each. The mass of each  $20 \times 10^3$  kg. Determine the frequencies of vibration. Neglect friction between the wheels and rails.
8. Use Stodola's method to find the natural frequency of the system shown in figure.

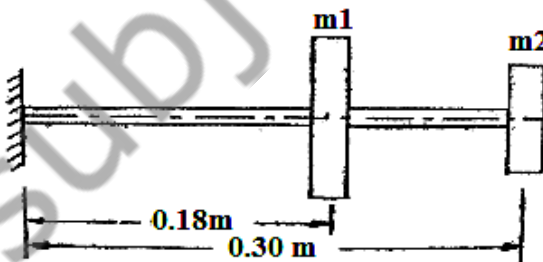


Fig.

9. Two bodies having equal masses as 60 kg each and radius of gyration 0.3 m are keyed to both ends of a shaft of 0.80 m long. The shaft is 0.08 m in diameter for 0.30 m length, 0.10 m diameter for 0.20 m length and 0.09 m diameter for rest of the length. Find the frequency of the torsional vibrations. Take  $G = 9 \times 10^{11}$  N/m<sup>2</sup>.

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