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Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (ME) (2011 Onwards) (Sem.-7,8)

**MECHANICAL VIBRATIONS**

Subject Code : BTME-803

M.Code : 71996

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**

**Q1. Answer briefly :**

- a) Define harmonic series.
- b) What is time period?
- c) What is logarithmic decrement?
- d) Define semi definite system.
- e) What is transverse vibration?
- f) Define eigen value.
- g) What is a continuous system?
- h) Define principal mode of vibration.
- i) Write two uses of vibration.
- j) Write one advantage of critical damping.

## SECTION-B

- Q2. An instrument has a natural frequency of 10 Hz. It can stand a maximum acceleration of  $10\text{m/s}^2$ . Find maximum amplitude of displacement.
- Q3. A spring-mass system with mass  $m$  kg and stiffness  $k$  N/m has a natural frequency of 1Hz. Determine the value of stiffness  $k_1$  of another spring which when arranged in conjunction with spring of stiffness  $k$  in series will lower the natural frequency by 20% and in parallel will raise the natural frequency by 20%.
- Q4. Describe centrifugal pendulum vibration absorber.
- Q5. Find the lowest natural frequency of transverse vibrations for the system shown in Fig. 1. By Rayleigh's method.

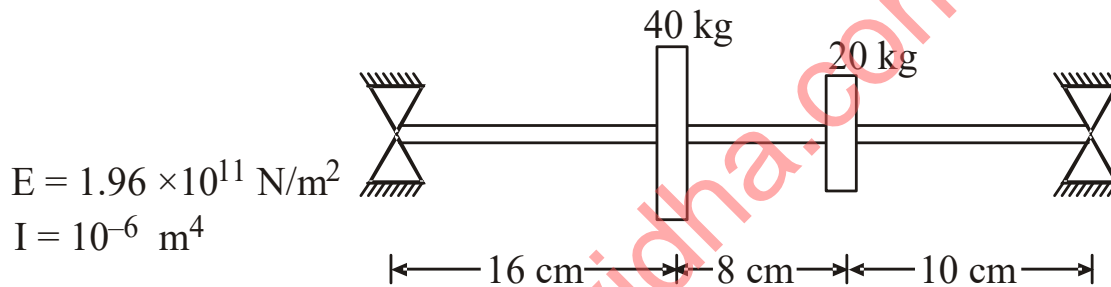


Fig. 1

- Q6. Derive frequency equation for a beam with both ends free and having transverse vibration.

## SECTION-C

- Q7. An air craft radio weighing 118 N is to be isolated from engine vibrations ranging in frequencies from 1600 to 2200 epm. What static deflection must the isolator have for 85% isolation?
- Q8. A gun barrel of mass 600 kg has a recoil spring of stiffness 294000 N/m. If the barrel recoils 1.3 m on firing, determine @ initial recoil velocity of the barrel and the time required for the barrel to return to a position 5cm from the initial position.

Q9. A four rotor system is represented in Fig. 2. Find the amplitude of vibration when the external torque acts on the first rotor.

$$J_1 = 817 \text{ kg-m}^2$$

$$J_2 = 608 \text{ kg-m}^2$$

$$J_3 = 100 \text{ kg-m}^2$$

$$J_4 = 120 \text{ kg-m}^2$$

$$K_{t1} = 30 \times 10^6 \text{ N-m/rad}$$

$$K_{t2} \square K_{t3} = 42 \times 10^6 \text{ N-m/rad}$$

$$T_0 = 12,000 \text{ N-m}$$

$$\omega = 200 \text{ rad/sec}$$

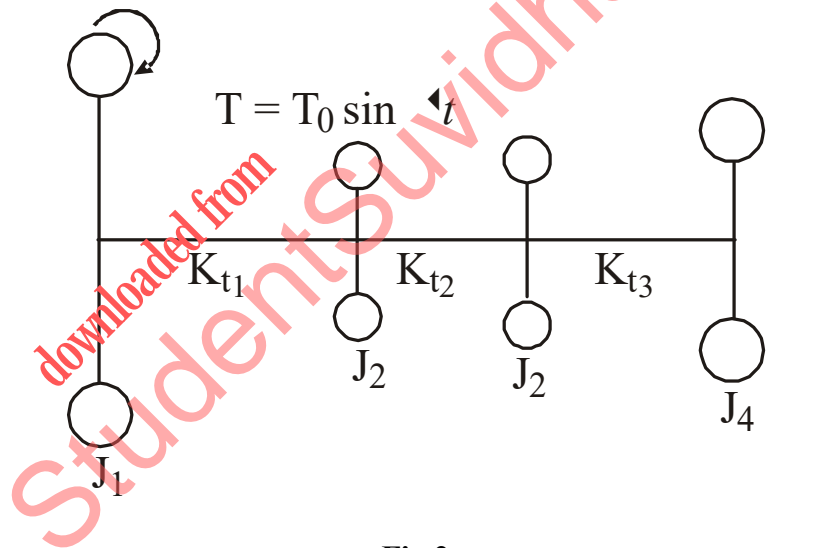


Fig.2

**NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC case against the Student.**