[6181]-232

B.E. (Mechanical)
DYNAMICS OF MACHINERY
(2019 Pattern) (Semester-VII) (402042)

Time : 2½ Hours]   *[Max. Marks : 70*

Instructions to the candidates:

1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume Suitable data if necessary.*

Q1) a) Determine the natural frequency of the mass 'm' placed at one end of a cantilever beam of negligible mass as shown in fig. 1a. **[5]**
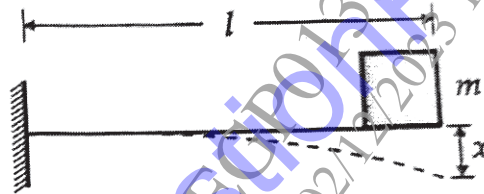

Fig. 1a

b) Explain with neat diagram mathematical model of a motorbike. **[6]**

c) A circular cylinder of mass 4 kg and radius 15 cm is connected by a spring of stiffness 4000N/m as shown in Fig. 1c. If it is free to roll on surface without slipping, determine the natural frequency. **[6]**
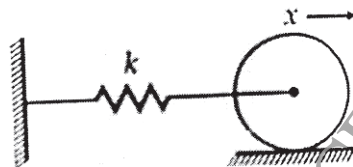

Fig. 1c

OR

P.T.O.

Q2) a) Define the term damping factor and explain with neat sketches, underdamped, overdamped and critically damped systems. **[8]**

b) An under-damped shock absorber is to be designed for a motorcycle of mass 200 kg such that during a road bump, the damped period of vibration is limited to 2 second and amplitude of vibration should reduce to one-sixteenth in one cycle. Find the spring stiffiness and the damping coefficient of shock absorber. **[9]**

Q3) a) Derive an expression for the amplitude of vibration for a system having rotating or reciprocating unbalance. **[8]**

b) A machine part of mass 4 kg vibrates in a viscous fluid. Determine the damping coefficient when a harmonic exciting force of 50 N results in resonant amplitude of 250 mm with a period of 0.4 second. If the excitation frequency is 2 Hz, find the percentage increase in the amplitude of forced vibration when damper is removed. **[10]**

OR

Q4) a) A radio set of 20 kg mass has to be isolated from a machine vibrating with an amplitude of 0.05 mm at a speed of 500 cpm. The set is mounted on four isolators, each having a spring scale of 31400N/m and damping coefficient of 392 N-s/m. Determine **[10]**

  i)   Amplitude of vibration of radio set

  ii) Dynamic load on each isolator due to vibration.

b) Derive an expression for deflection of vertical shaft with a single rotor without damping. **[8]**

Q5) a) Explain the concept of torsionally equivalent shaft and derive equation for its equivalent length. **[7]**

b) Determine the natural frequency and corresponding mode shapes of given system shown in Fig. 5b when K = 40N/m and m = 10kg. **[10]**

Fig. 5b

OR

[6181]-232   2

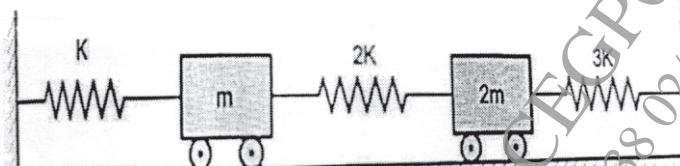*Q6)* a) Explain the torsional vibrations of geared system neglecting inertia of gears. **[7]**

b) For a spring-mass system shown in Fig. 6b, find Eigen values and Eigen vectors by matrix method. **[10]**
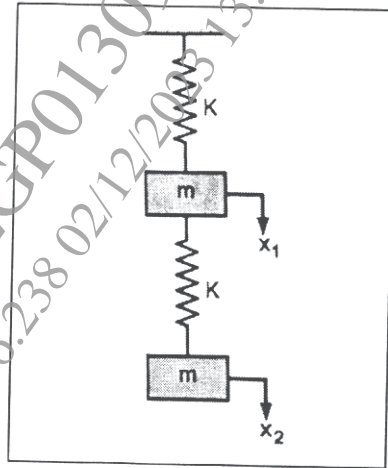
Fig. 6b

Q7) a) What is FFT analyzer? Explain the importance of frequency spectrum for machinery fault detection. **[10]**

b) Explain the process of vibration measurement with neat sketch. **[8]**

OR

Q8) a) What are different methods of vibration control? Explain any one in detail. **[6]**

b) Explain with neat sketch the working of sound level meter. **[6]**

c) Explain anechoic chamber and reverberant chamber. **[6]**

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