Roll No. | | | | | | | | | | | | | **Total No. of Pages : 03**

Total No. of Questions : 09

B.Tech.(ME) (Sem.–7,8)

MECHANICAL VIBRATIONS

Subject Code : ME-408

Paper ID : [A0841]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTION 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 has to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) Why the study of vibration is necessary in engineering?

b) What is resonance?

c) What is vibration isolation?

d) Define semi definite system.

e) Define a continuous system.

f) Define eigen vector.

g) What is longitudinal vibration?

h) Explain the use of critical damping.

i) How many nodes are there in a two rotor system?

j) What is the difference between energy method and Rayleigh method?

SECTION-B

2. Split the harmonic motion $x = 10\sin(\omega t + \pi/6)$ into two harmonic motions one having a phase angle of zero and the other of 45°.

3. Represent the periodic motions given in Fig.1 by harmonic motion.

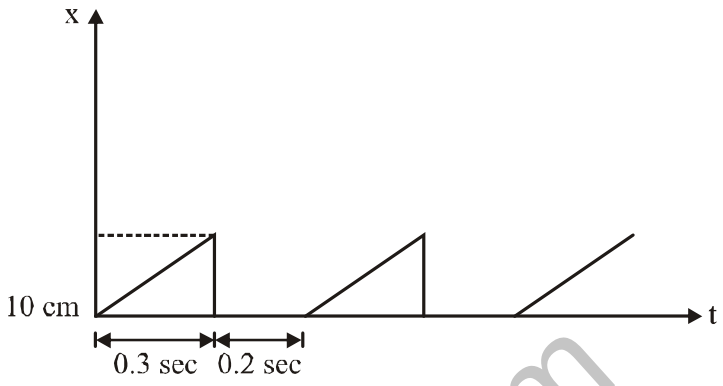

Fig. 1

4. A spring mass system has spring constant k N/m and mass m kg. It has natural frequency of vibration as 12 *c.p.s*. An extra 2 Kg mass is coupled to m and nature frequency reduced by 2 *c.p.s*. Find the values of k and m.

5. Determine the nature frequency of the spring mass system shown in Fig.2.

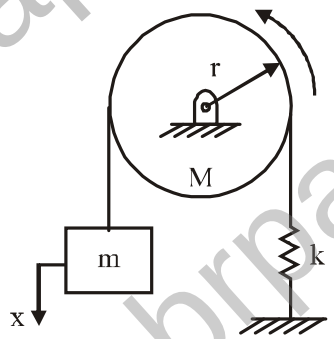

Fig. 2

6. Determine centrifugal pendulum vibration absorber.

SECTION-C

7. Derive the frequency equation of torsional vibrations for a free-free shaft of length *l*.

8. A four rotor system is shown in Fig.3. A torque $T = T_0 \sin \omega t$ acts on the second rotor. Determine the amplitude of vibration of all rotors.

$J_1 = 100$ kg – m^2

$J_3 = 10$ kg – m^2

$J_2 = J_4 = 50$ kg – m^2

$K_{t_1} = K_{t_2} = 10^4$ N – m^2/ rad

$K_{t_3} = 2\times 10^4$ N – m^2/ rad

$T_0 = 10{,}000$ N–m

$\omega = 5$ rad/sec.

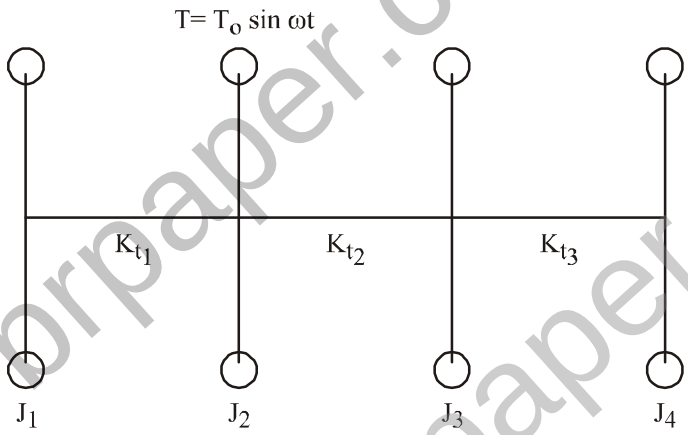

Fig. 3

9. Solve the problem as phase in Fig.4.

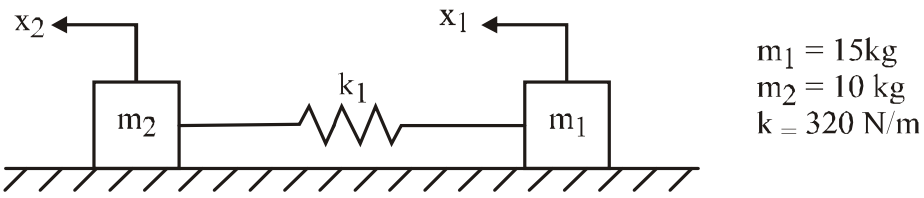

Fig. 4