Roll No.
Total No. of Questions : 09]

[Total No. of Pages : 03

B.Tech. (Sem. - 7th/8th)

MECHANICAL VIBRATIONS

SUBJECT CODE : ME - 408

Paper ID : [A0841]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours **Maximum Marks : 60**

Instruction to Candidates:

1) Section - A is **Compulsory**.
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

Section - A

Q1) *(10 × 2 = 20)*

a) Define degree of freedom of a vibratory system.

b) What are the three elementory parts of a vibrating system?

c) What is a semi definite system?

d) What are the common type of domping?

e) What do you mean by beat phenomenon?

f) What is vibration isolation?

g) Mention two practical examples of critical damping.

h) What is principal co-ordinates?

i) Name the seismic instruments.

j) What are influence co-efficients?

Section - B

(4 × 5 = 20)

Q2) Split up the harmonic motion 8 sin (wt + π/4) into two harmonic motions one of which has an amplitude of 10 and phase difference zero.

Q3) In a spring mass system, the mass of 10kg makes 40 oscillations in 20 seconds without damper. With damper, the amplitude decreases to 0.20 of the original value after 5 oscillations. Find out :

(a) Stiffness of the spring.
(b) Logarithmic decrement.
(c) Damping factor.
(d) Damping co-efficient.

Q4) Draw a neat sketch of centrifugal pendulum absorber and explain its working.

Q5) A machine weighing 10,000N and supported on springs of total stiffness 800N/mm has an inbalanced rotating element which results in a disturbing force of 400N at a speed of 3000 r.p.m. Assume a damping factor $\xi = 0.20$, determine :

(a) The amplitude of motion due to inbalance and its phase angle.
(b) The transmissibility and
(c) The transmitted force and its phase angle.

Q6) Two simple pendulum of length L each are connected by a spring of stiffness K as shown in Fig-1. K = 150N/m, m = 5kg.
L = 0.20m, and a = 0.1m, determine the natural frequencies of the system.

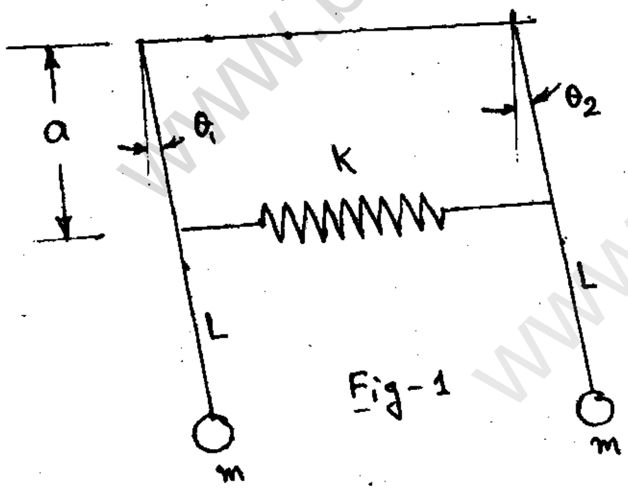

Fig-1

Section - C

(2 × 10 = 20)

Q7) A small turbine rotor and its shaft are equivalent to a shaft 100cm long and 10cm diameter. Three discs weiging 2500N, 3000N and 3750N at 25cm, 43cm and 70cm respectively. The total deflection under the loads are found to be 0.12mm, 0.17mm and 0.13mm respectively. Neglecting the weight of the shaft, calculate the critical speed by the Rayleigh's method and compare it with the value obtained by Dumkerley's method. $E = 2 \times 10^5$ N/mm^2.

Q8) Find the fundamental frequency of vibration of the system shown in Fig-2 by Stodola's method.

K = 10 N/mm and m = 2.0kg.

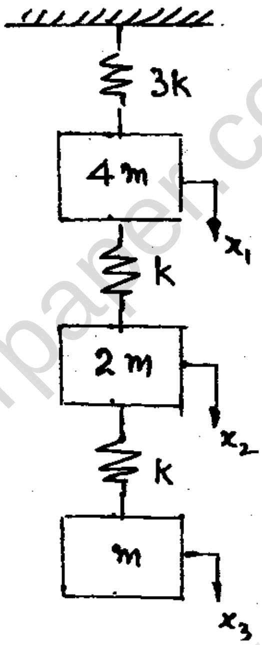

Fig-2

Q9) Derive suitable expression for longitudinal vibrations for a rectangular uniform cross-sectional bar of length "*l*" fixed at one end free at the other end.

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