CBCS SCHEME

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15AU82

Eighth Semester B.E. Degree Examination, June/July 2019
Mechanical Vibrations

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Write the difference between (with sketch if applicable):
i) Linear and non-linear vibration
ii) Deterministic and random vibration **(04 Marks)**

b. Define the following terms with equations:
i) Simple Harmonic Motion
ii) Degrees of freedom **(04 Marks)**

c. In the following harmonic motion:

i) $X_1 = 0.5\cos\frac{\pi}{2}t$ ii) $X_1 = \cos\pi t$

$X_2 = \sin\pi t$ $X_2 = 0.5\cos 2t$

is the sum $(X_1 + X_2)$ in each case a periodic motion? If so what is its period? **(08 Marks)**

OR

2 a. Determine the natural frequency of the system as shown in Fig.Q2(a). (Neglecting the mass of rod)

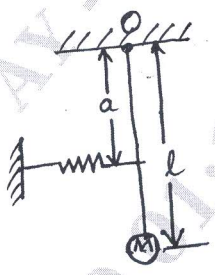

Fig.Q2(a) **(08 Marks)**

b. An Instrument panel of natural period 0.1 second, is excited by a step function 0.5 cm magnitude for a period of 0.075 second. Determine the response of the system. **(08 Marks)**

Module-2

3 a. Obtain the response of Logarithmic decrement for an order damper system. **(08 Marks)**

b. Obtain the differential equation of motion for the system as shown in Fig.Q3(b) and find:
i) Critical damping coefficient
ii) Damping ratio
iii) Natural frequency of undamped oscillations.

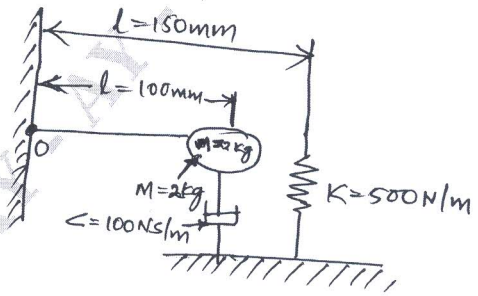

Fig.Q3(b) **(08 Marks)**

OR

4 a. Write down the difference between the without air damping and with air damping with a neat sketch. **(08 Marks)**

b. Explain the following:

i) Critical damping ii) Damping ratio

iii) Logarithmic decrement iv) Damped Natural frequency **(08 Marks)**

Module-3

5 a. Define transmissibility. Derive an expression for motion transmissibility. **(08 Marks)**

b. A machine of total mass 200 kg is supported on springs of total stiffness 16,000 N/cm has an unbalanced rotating element which result in a disturbing force 800 N at a speed of 3000 rpm. Assuming $\xi = 0.2$, determine:

i) Amplitude of motion during to unbalance

ii) Transmissibility

iii) Transmitted force **(08 Marks)**

OR

6 a. Derive an expression for an sharpness of resonance. **(08 Marks)**

b. A periodic excitation as shown in Fig.Q6(b) is applied to the base of the spring mass dashpot system. Determine the equation of motion of the system.

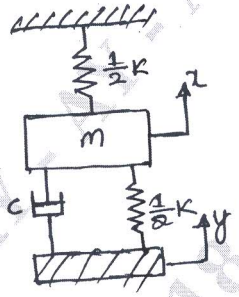

Fig.Q6(b) **(08 Marks)**

Module-4

7 a. A two degree of freedom vibrating system is shown in Fig.Q7(a). Determine the two natural frequencies of vibrations in a system.

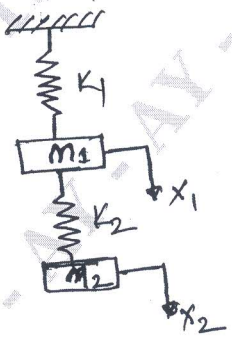

Fig.Q7(a)

Given $m_1 = 2$ kg, $m_2 = 1$ kg, $k_1 = 40$ N/m, $k_2 = 20$ N/m **(08 Marks)**

b. A machine part vibrates with large amplitude when the compressor speed is 250 rpm. To study the vibration, a spring mass system is suspended from the machine part to act as an absorber. A 2 kg absorber mass tuned to 250 cpm resulted in two resonant frequencies of 200 and 300 cpm. Determine the equivalent spring and mass constants for the machine part. **(08 Marks)**