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Total No. of Pages: 02
Total No. of Questions: 09

B.TECH (Sem.-7th, 8th)
MECHANICAL VIBRATIONS
Subject Code: ME-408
Paper ID: [A0841]

Time: 3 Hrs.

Max. Marks: 60

INSTRUCTIONS TO CANDIDATE:

1. SECTION-A is compulsory.
2. SECTION-B Attempt any four questions.
3. SECTION-C Attempt any two questions.

SECTION-A

(10x2=20)

Q.1.

- (a) What are different types of vibrations?
- (b) Define slip or interfacial damping.
- (c) Differentiate between viscous damping and coulomb damping.
- (d) What do you mean by natural frequency?
- (e) List parts of a vibrating system.
- (f) What are the reasons of unbalance in the system?
- (g) What is beat phenomenon?
- (h) What is the difference between vibration isolation and absorber?
- (i) What are the methods by means of which undesirable vibrations can be controlled?
- (j) What do you mean by critical damping?

Section-B

(4x5=20)

Q.2. An instrument has a natural frequency of 10 Hz. It can stand a maximum acceleration of 10 m/s^2 find the maximum amplitude of displacement.

Q.3. A steel shaft 6 cm diameter and 50 cm long fixed at one end carries a flywheel of weight 1000 kgf and radius of gyration 30 cm at its free end. Find the frequency of free longitudinal transverse and torsional vibrations. $E=2 \times 10^6 \text{ kgf/cm}^2$ and $C=3.8 \times 10^6 \text{ kgf/cm}^2$

- Q.4.** A body of 5 kg is supported on a spring of stiffness 200 N/m and has dashpot connected to it which produces a resistance of 0.002N at a velocity of 1 cm/sec. In what ratio will the amplitude of vibration be reduced after 5 cycles?
- Q.5.** What do you understand by a transducer? Explain the significance of vibration measurements.
- Q.6.** Write short note on Matrix iteration method?

Section-C

(2x10=20)

- Q.7.** Explain semi definite system in detail. You can support your answer with suitable examples.
- Q.8.** Show that simple harmonic motions with frequency p and $2p$ when added will result in periodic function of frequency p . Generalize the above for a number of harmonic Functions with frequencies $p, 2p, \dots, np$ etc.
- Q.9.** The vibrations of railway station are periodic at the frequency range of 12-50 Hz. A vibration measuring instruments is to be installed on some foundation independent of the platform. The small foundation is supported by four identical springs resting on the platform. The total mass of the instrument and foundation is 50 kg. What is the maximum value of spring stiffness, if the amplitude of transmitted vibration is to be less than 10% of the platform vibration over the given frequency range, Take $\epsilon=0.20$. System is treated as single degree of freedom.

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