

Roll No.

--	--	--	--	--	--	--	--	--	--	--	--

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

B.TECH (Sem.-7th)
MECHANICAL VIBRATIONS
Subject Code: BTME-803
Paper ID: [A3064]

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) Represent $-3+j4$ in exponential form.
- (b) Define D'Alembert's principle.
- (c) Differentiate between viscous damping and coulomb damping.
- (d) Draw a displacement vs time graph for all types of damping.
- (e) What are the reasons of unbalance in the system?
- (f) Define resonance.
- (g) What is the difference between vibration isolation and absorber?
- (h) What are the methods by means of which undesirable vibrations can be controlled?
- (i) What are generalized coordinates?
- (j) Define influence coefficient?

SECTION-B

(4x5=20)

Q.2.

Show that simple harmonic motions with frequency p and $2p$ when added will result in a periodic function of frequency p . Generalize the above for a number of harmonic functions with frequencies $p, 2p, \dots, np$ etc.

- 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.** The vibrations of railway station are periodic at the frequency range of 12-50 Hz. A vibration measuring instrument 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 frequency range. Take $\epsilon=0.20$. System is treated as single degree of freedom.
- Q.6.** Write a short note on Holzer Method?

SECTION-C

(2x10=20)

- Q.7.** Calculate the natural frequency of a shaft of diameter 10 cm and length 300 cm carrying two discs of diameter 125 cm and 200 cm respectively at its ends and weighing 480 N and 900 N respectively. Modulus of rigidity of shaft may be taken as $1.96 \times 10^{11} \text{ N/m}^2$.
- Q.8.** Three rail bogies are connected by springs of stiffness $40 \times 10^5 \text{ N/m}$ each. The mass of each $20 \times 10^3 \text{ kg}$. Determine the frequencies of vibration. Neglect friction between the wheels and rails
- Q.9.** Explain matrix iteration method by taking suitable example of three masses connected by springs in series.

.....END.....