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	B.Tech. VI-Sem. (Main/Back) Examination, April/May - 2026	
	Automobile Engineering 6AE4-03 Mechanical Vibrations ME, AE	

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. Write any two outcomes of the course "Mechanical Vibrations".
2. Define resonance.
3. State degree of freedom.
4. Write the importance of centre of percussion.
5. What do you mean by 'hysteretic damping'?
6. Write the difference between vibration isolation and transmissibility.
7. Define 'Mode shapes'.
8. Write the physical significance of critical speed of a shaft.
9. Why we use 'Dunkerley's method'?
10. State "Continuous System".

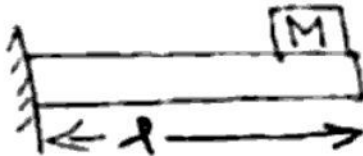
PART : B

(Analytical/Problem solving questions)

Attempt any Five questions.

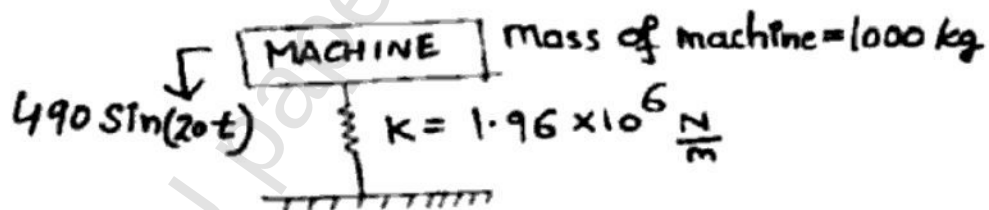
(5×4=20)

1. Discuss in brief on "industrial noise control strategies".
2. Convert into exponential form
 - i) $1 - 2i$
 - ii) $-1 + 2i$
3. Discuss on natural frequency of transverse vibration of following



M is the external Mass and EI is the flexural rigidity of the beam. The weight of beam is negligible. l is the length of the beam.

4. Determine the amplitude of the motion of machine (Figure is given below)



The amplitude of the external Force is 490 N.

5. Explain the working principle (in brief) of undamped dynamic vibration absorber with its limitation.
6. Discuss about materials used in vibration isolation.
7. Explain Maxwell reciprocal system.

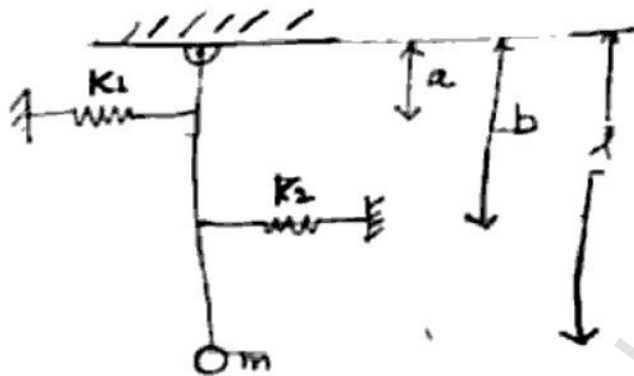
PART - C

(Descriptive/Analytical/Problem Solving/Design question)

(3×10=30)

Attempt any Three questions.

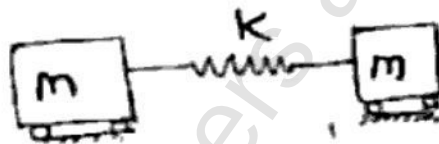
1. Derive an expression for natural frequency of following system (undamped)



M is the point mass. The mass of the vertical string is taken as zero

Write the assumptions also.

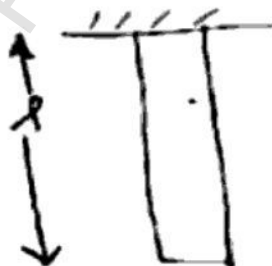
2. Discuss and calculate the principal modes of vibrations of following



$$m: 10 \times 10^3 \text{ kg}$$

$$K: 2.94 \times 10^6 \text{ N/m}$$

3. Determine the equation for the natural frequencies of a uniform rod subjected to torsional oscillation with one end fixed and the other end free as shown in figure.



4. Split harmonic motion

$x = 10 \sin(\omega t + \frac{\pi}{6})$ into two harmonic motions, one having a phase angle of 0° and other of 45° .

5. Derive an expression for logarithmic decrement and discuss the physical significance of it in the vibration analysis of a mechanical system.
