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

B. Tech. (ME) (Sem. 7, 8)
MECHANICAL VIBRATIONS
Subject Code: BTME-803
Paper ID: A3064

Time: 3 Hrs. **Max. Marks: 60**

INSTRUCTIONS TO CANDIDATES:

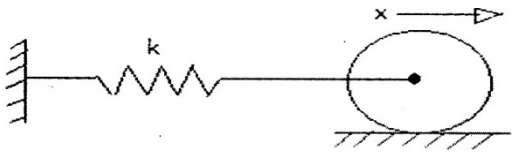
1. **Section A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **Section B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **Section C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

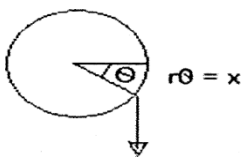
SECTION A

1. Write short notes on following;
   a) How can you reduce unnecessary vibrations?
   b) Define natural frequency.
   c) State the different types of damping.
   d) What is two degree of freedom system?
   e) State the importance of Holzer's analysis.
   f) Write the names of materials which are used for vibration isolation.
   g) Differentiate between vibration absorber and vibration isolator
   h) A light cantilever of length 'L' has a mass 'M' fixed at its free end. What will be the frequency of lateral vibrations in the vertical plane?
   i) What do you -mean by under damped system?
   j) Discuss the torsional oscillation.

SECTION B

2. Add two harmonic motions analytically which are expressed by the Equations, $x_1=4 \sin (7t+30°)$, $x_2=5 \cos (7t-15°)$.
3. A circular cylinder of mass 10kg and radius 25 cm is connected by a spring of stiffness 4500N/m as shown in fig. It is free to roll on horizontal rough surface without slipping. Determine the natural frequency.





4. Explain Dunkerley's method to evaluate the natural frequency of structures.

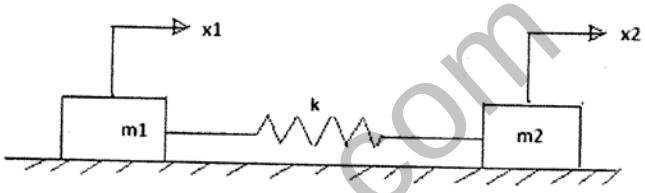
5. A vibrating body having mass 2 kg is suspended by a spring of stiffness 2000 *N/m* and it is put to harmonic excitation of 20N.Assuming viscous damping, determine :(a) the resonance frequency , (b) phase angle at resonance, (c) amplitude at resonance (d)The frequency corresponding to the peak amplitude (e) damped frequency. Assume visco1+s damping coefficient= 40 N-sec/m.

6. Derive a suitable expression for longitudinal vibrations for a rectangular uniform cross-section bar of length ' L' fixed at one end and free at the other end.

SECTION C

7 i) Explain the construction and working of Untuned Dry Friction Damper with the help of neat sketch.

ii) Find the equations of motions by using Lagrange's equation for a system as shown in fig.



8. (i) Write a note on accelerometer.

(ii) A 5 kg mass attached to the lower end of a spring, whose upper end is fixed, vibrates with a natural period of 0.45sec.Determine the natural period when 2.5 kg mass is attached to the mid point of the same spring with upper and lower ends fixed.

9. A uniform string of length L and a large initial tension S, stretched between two supports is displaced laterally through a distance a_0 at the center as shown in fig and is released at t=0.Find the equation of motion for the string.