Roll No. ☐☐☐☐☐☐☐☐☐☐☐   **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech. (ME) (2011 Onwards)   (Sem.–7,8)
MECHANICAL VIBRATION
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 briefly :**

   a) Define mechanical vibration.

   b) Why is it important to find the natural frequency of a vibrating system?

   c) Explain resonance.

   d) Define damping ratio.

   e) What is the difference between steady vibration and transient vibration?

   f) State the design criteria for acceleration measuring instruments.

   g) What is the difference between vibrometer and accelerometer?

   h) What is the dynamic vibration absorber?

   i) What is stiffness influence coefficient?

   j) What is the natural boundary conditions?

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BSC-IT, MSC-IT.

SECTION–B

2. "*Continuous system have infinite degree of freedom*" do you agree with this statement. Explain your answer with help of example.

3. A mass is suspended from a spring system shown as **Fig.1**. Determine the natural frequency of system. If $k_1 = 5000$ N/mm, $k_2 = k_3 = 8000$ N/mm, $m = 25$ kg.
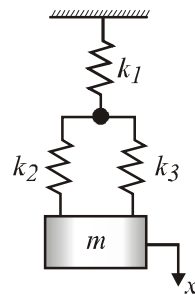

Fig. 1

4. What is coulomb damping? Explain the possible conditions of coulomb damping.

5. Derive the equation of motion of a vibration body with use of Lagrange's equations.

6. Draw a neat sketch of centrifugal pendulum absorber and explain its working.

SECTION–C

7. Find the lowest natural frequency of vibration for the system shown in **Fig. 2** by Rayleigh's method.

$E = 1.96 \times 10^{11}$ N/m^2
$I = 4 \times 10^{-7}$ m^4

$M_1 = 100$ kg
$M_2 = 50$ kg
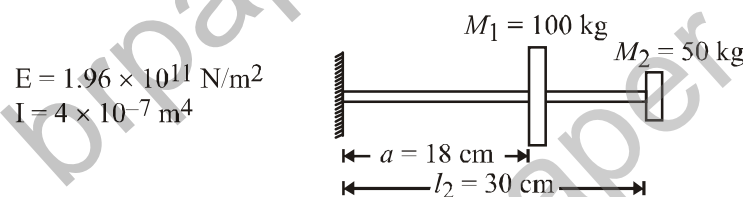$a = 18$ cm
$l_2 = 30$ cm

Fig. 2

8. Find frequency equation of a uniform beam fixed at one end and free at other for transverse vibration.

9. Write the short notes of **any two** of the following :

a) Stodola method

b) Vibration isolation

c) Waking of dry friction damper