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

Total No. of Questions : 09

B.Tech.(Marine Engg.) (2013 Onwards)   (Sem.–7)
MECHANICAL VIBRATIONS
Subject Code : BTME-803
M.Code : 74247

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. **Answer briefly :**

   a) What do you mean by natural frequency?

   b) What are the reasons of unbalance in the system?

   c) What is critical damping?

   d) What is orthogonality principle?

   e) Represent -3+j4 in exponential form.

   f) Define resonance.

   g) Define two degree of freedom system with a neat sketch.

   h) What is self excited vibration?

   i) What are vibrometers?

   j) Name various methods of vibration control.

SECTION-B

2. A steel shaft 6 cm in 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. $E = 2 \times 10^6$ Kgf/cm^2 and $C = 3.8 \times 10^6$ Kgf/cm^2.

3. Explain the working of a centrifugal pendulum absorber with the help of a neat sketch.

4. A vibratory body of mass 150 kg supported on spring of total stiffness 1050 KN/m has a rotating unbalanced force of 525 N at a speed of 6000 rpm. If the damping factor is 0.3, determine (i) the amplitude caused by the unbalance and its angle, (ii) transmissibility, (iii) the actual force transmitted and its angle.

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

6. Discuss the working principle of viscous damper.

SECTION-C

7. Two rear wheels of an automobile support a mass of 500 kg through springs of stiffness 19600 N/m. What is the amplitude of vibration of the rear of the automobile at a speed of 80 km/hr on a road having waves 20 mm total depth whose crest are 1.5 meter apart? At what speed will there be resonance?

8. Write note on Rayleigh's method.

9. Determine the natural frequency of the system as shown in the figure below by influence coefficient method.

$m_1 = 100kg,$ $m_2 = 200kg,$ $m_3 = 300kg$

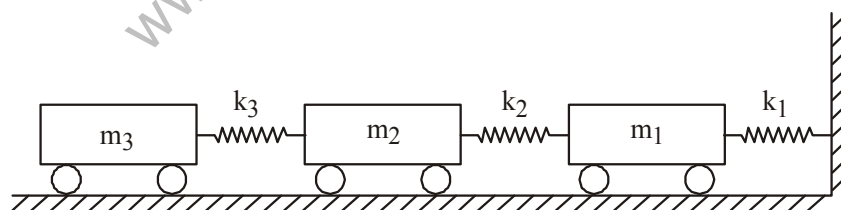$k_1 = 2 k N/m,$ $k_2 = 1.5 k N/m,$ $k_3 = 2 k N/m$

FIG.1

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.