INDIAN MARITIME UNIVERSITY
(A Central University, Govt.of India)

May/June 2015 End Semester Examinations

SEMESTER – IV, B.TECH (MARINE ENGINEERING)

MECHANICS OF MACHINES - II (T 2403 / T 1403)

Date:12.06.2015 **Max.Marks:100**
Time:-3 Hrs **Pass Marks:50**

PART – A **(3 x10 = 30 Marks)**
(Compulsory Questions)

1. a) State the advantages and disadvantages of a roller bearing compared to a journal bearing.

   b) What do you understand by ***degree of freedom***?

   c) Differentiate between ***free*** and ***forced*** vibration.

   d) What are the major sources of damping?

   e) What is Viscous and Coulomb damping?

   f) For a whirling shaft, explain critical speed

   g) For an engine, what is "barred speed range"?

   h) State periodic time for simple pendulum and compound pendulum respectively.

   i) What do you understand by ***torsionally equivalent shaft***?

   j) What do you understand by "2-node vibration" and "3-node vibration"?

PART – B **(5 x14 = 70 Marks)**
(Answer any five of the following)

2. A mass of 15 kg is carried on a spring of stiffness 7500 N/m from a support which has a vertical harmonic motion of amplitude ± 4 mm at a frequency of 4 Hz. The motion of the mass is opposed by a force proportional to its absolute velocity, and of amount 75 N s/m. Calculate the amplitude of the steady motion of the mass.

(14)

3. An engine having 5 cylinders in line has successive cranks 144° apart, the distance between cylinder centre lines being 450 mm. The reciprocating mass for each cylinder is 16 kg, the crank radius is 135 mm and the connecting rod length 540 mm. The engine runs at 600 rev/min. Examine the engine for balance of primary and secondary forces and couples. Determine the maximum values of these and the position of the central crank at which these maximum values occur. **(14)**

4. A pendulum of mass 27 kg is suspended from a pivot, such that the distance of the pivot from the centre of gravity of the pendulum is 380 mm. When the amplitude of oscillation is small, the periodic time of oscillation is 1.6 s. If the pendulum is now made to swing with amplitude 45° on each side of the vertical, find the force exerted on the pivot at the extremity of the swing. **(14)**

5. A steel disc of 300 mm diameter, of mass 30 kg, is suspended from the end of a wire 2.5 mm diameter and 1.8 m long which is clamped in to a central hole in the disc, the upper end of the wire being rigidly supported. When the disc is set in torsional vibration it is found to make 10 complete oscillations in 78 s. Find the Modulus of rigidity of the wire, and calculate the amplitude of the oscillation which may be allowed if the maximum permissible intensity of shearing stress in the wire is 104 MN / m^2. **(14)**

6. Derive an expression for a torsionally equivalent shaft, where original shaft consists of diameter d_1 of length l_1 + diameter d_2 of length l_2 + diameter d_3 of length l_3. **(14)**

7. A shaft of length 0.75 m, supported freely at the ends, is carrying a body of mass 90 kg at 0.25 m from one end. Find the natural frequency of transverse vibration. Assume E = 200 GN / m^2. **(14)**

8. A mass of 5 kg hangs from a spring and makes damped oscillations. The time of 50 complete oscillations is found to be 20 s, and the ratio of the first downward displacement to the sixth is found to be 2.25. Find the stiffness of the spring and the damping force. **(14)**

****