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

May/June 2015 End Semester Examinations

SEMESTER – I, B.TECH (MARINE ENGINEERING)

ENGINEERING MECHANICS - I (T 2105 / T 1105)

Date:19.06.2015 **Max.Marks:100**
Time:-3 Hrs **Pass Marks:50**

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

1. a) Explain a truss and a frame with a diagram.

   b) Explain centre of gravity and centre of mass.

   c) Explain Super Elevation or Banking of roads.

   d) What is moment of Inertia and radius of gyration?

   e) What is Free Body Diagram?

   f) What is D'Alembert's principle?

   g) Explain Lami's theorem.

   h) What is statically indeterminate Structure?

   i) Explain radial and tangential components of acceleration.

   j) Explain the condition of equilibrium in a system of coplanar forces?

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

2. The position of a particle moving along a straight line is given by the relation $X= 30t^3-5t^2-10t +10$, where X is expressed as m and t in seconds. Determine:

   a) The time at which the velocity will be zero. **(4)**
   b) The position and distance traveled by the particle at that time**.** **(4)**
   c) The acceleration of the particle at that time. **(2)**
   d) The distance traveled by the particle in 2 s and 9 s. **(4)**

3. Two masses A and B having 80 Kg and 200 Kg respectively are suspended by a rope over a smooth pulley. Find the tension in the rope and the acceleration of the system. **(14)**

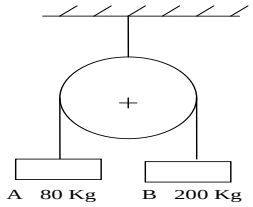
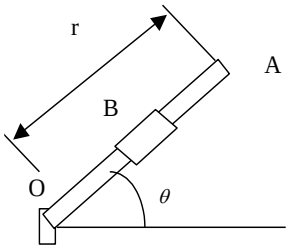


Fig. 2

4. Two trains A and B are moving in the same direction along parallel lines. The train A is moving with uniform speed of 72 km/hr and 150 m behind the train B. The train B started from the station with uniform acceleration of 1 m/s^2. Show that the trains A and B will meet each other twice and find their speeds when this happens. **(14)**

5. The rotation of rod OA about O is defined by the relation $\theta = 3.0\ t^2$, where θ is expressed in radians and t in seconds. Collar B slides along the rod in such a way that distance from O is r = 100 t^2-20t^3, where r is expressed in mm and t in seconds. When t=3.0 determine the velocity of the collar. **(14)**



6. Determine the centroid of the plane area bounded by the curve y= 16x^2 between the points (0, 0) and (1, 16) and the x-axis. **(14)**

7. Determine the moment of Inertia for a circular lamina with radius 100 cm about the diametral axis. **(14)**

8. A projectile is fired from the edge of a 151 m high cliff with an initial velocity of 181 m/s at an angle of 31^o with the horizontal. Find the greatest elevation above the ground level reached by the projectile and the horizontal distance from the gun to the point where the projectile strikes the ground. **(14)**

9. Three vectors $\vec{A}, \vec{B}\ and\ \vec{C}$ are as given below. Find the resultant and the direction of unit vector along the resultant.

$$\vec{A} = \vec{i} + \vec{j} - 2\vec{k},\ \vec{B} = 4\vec{i} + 3\vec{j} - 2\vec{k},\ \vec{C} = 2\vec{i} + \vec{j} + \vec{k} \qquad \textbf{(14)}$$

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