

INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)

June 2017 End Semester Examinations
B. Tech (Marine Engineering – First Semester)

Engineering Mechanics – I - UG11T 2105/UG11T 1105

Date: 06.07.2017
Time: 3 Hrs

Maximum Marks : 100
Pass Marks : 50

PART – A (10x3=30 Marks)
All Questions are compulsory

1. a) State and explain Parallelogram law of forces?
- b) Define Free – body Diagram?
- c) A force $F=8.25i + 12.75j - 18k$ acts through the origin. What is the magnitude of this force and angle it makes with x, y and z axis?
- d) Derive the relation between mechanical advantage, velocity ratio and efficiency?
- e) Define centroid, Centre of mass and Centre of gravity?
- f) Define radius of gyration?
- g) State the principle of work and energy.
- h) State D 'Alembert's principle.
- i) State the principle of virtual work.
- j) Define amplitude, time period and frequency in periodic motion.

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

2. Determine the location of the centroid of the shaded area, as shown in Fig 1. (14 Marks)

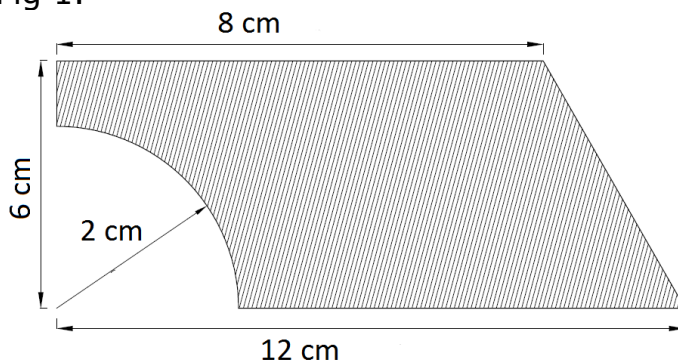


Fig 1

3. Calculate the moment of inertia about horizontal and vertical gravity axes (I_{xx} and I_{yy}) of the angle section shown in Fig 2. (14 Marks)

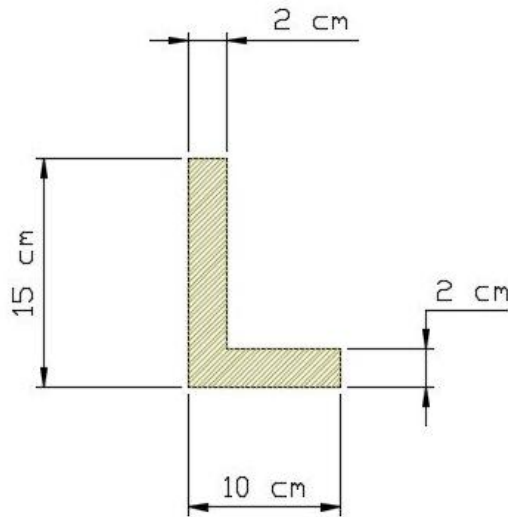


Fig 2

4. In a certain weight lifting machine, a weight of 1kN is lifted by an effort of 25N. While the weight moves up by 100 mm, the point of application of effort moves by 8 m. Find mechanical advantage, velocity ratio and efficiency of the machine. Also find the effort lost in friction. (14 Marks)
5. The acceleration of a particle moving along a straight line is defined by $a = 8 - x$. The particle starts from rest at $t = 0$ and origin $x = 0$. Determine a) Velocity of the particle when $x = 10\text{m}$, b) the position of the particle when velocity becomes zero and c) Velocity of a particle when acceleration becomes zero. (14 Marks)

6. Determine the reaction and the forces in each member of the simply supported truss as shown in Fig 3. (14 Marks)

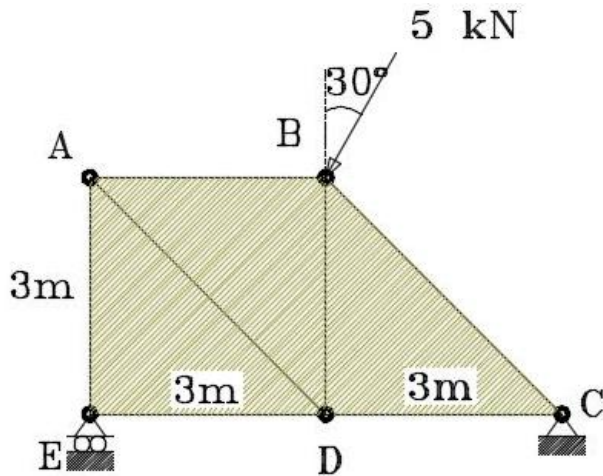


Fig 3

7. A 10 kg weight is dropped on a spring from 13 cm height, as shown in Fig 4. Determine the maximum deflection of the spring if the stiffness of the spring becomes 0.57 N/mm. (14 Marks)

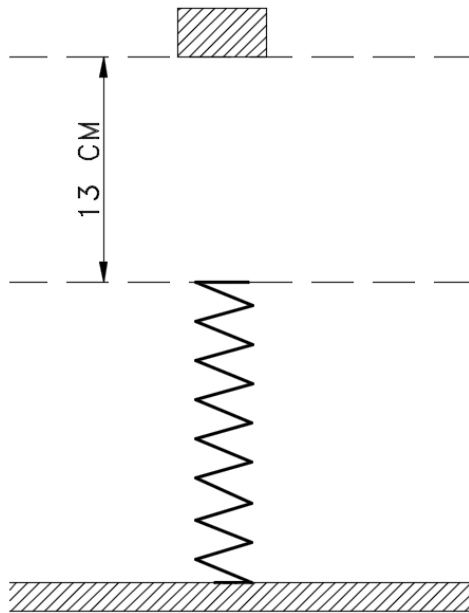


Fig 4

8. What load will be lifted by an effort of 120 N, if the velocity ratio is 18 and efficiency of the machine is 60%? Determine the law of the machine if it is observed that an effort of 200 N is required to lift a load of 2600 N and find the effort required to run the machine at a load of 3.5 KN. (14 Marks)
