Reg. No. : | | | | | | | | | | |

Question Paper Code: 31076

B.E. / B.Tech. DEGREE EXAMINATION, OCTOBER 2014.

Third Semester

Mechanical Engineering

01UME305 – ENGINEERING MECHANICS

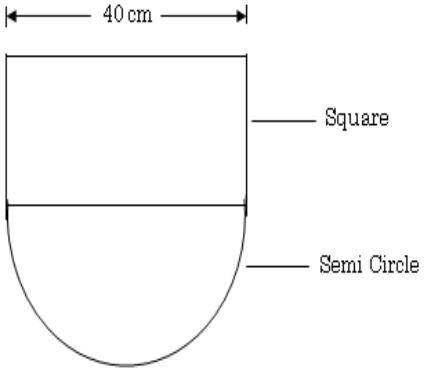
(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. The angle between the resultant (35 N) of two forces and one of the forces (15 N) is 38.21^0. Find the other force.
2. Find the magnitude and direction cosines of the resultant of two concurrent forces. $F_1 = 4i + 8j - 8k$ and $F_2 = 5i - 5j + 4K$
3. List the steps to be followed in drawing a free body diagram.
4. Sketch the types of supports with their reactions.
5. Locate the centroid of the lamina shown in fig.



6. What is the relationship between area moment of inertia and mass moment of inertia?

7. A car starts from rest with a constant acceleration of $4 m/s^2$. Determine the distance travelled in 7 seconds.

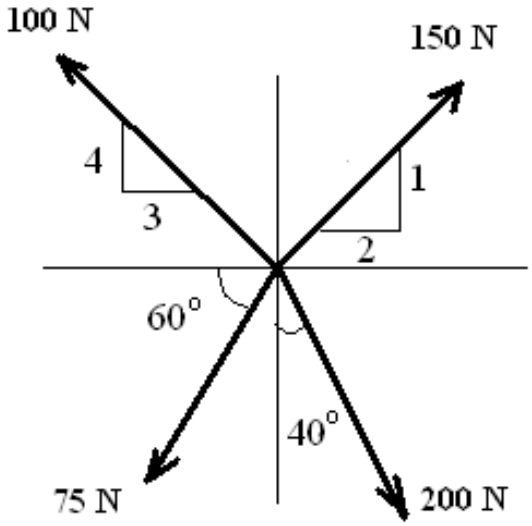
8. Differentiate kinematics and kinetics.

9. A body weighing 120 N resting on horizontal table top is just moved by a horizontal force of 55 N. Calculate co-efficient of friction.

10. What does general plane motion refer to?

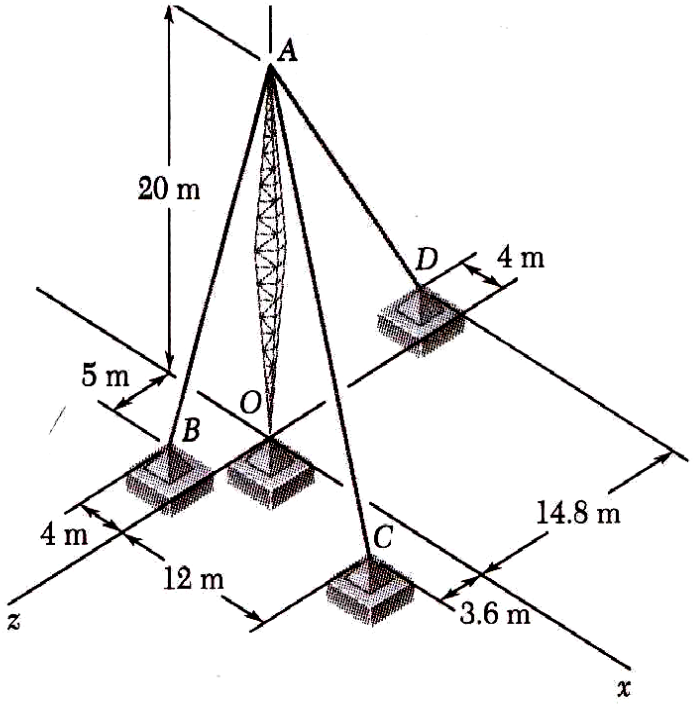
PART - B (5 x 16 = 80 Marks)

11. (a) For the system of four forces acting on a body shown in figure, determine the resultant force and its direction. (16)

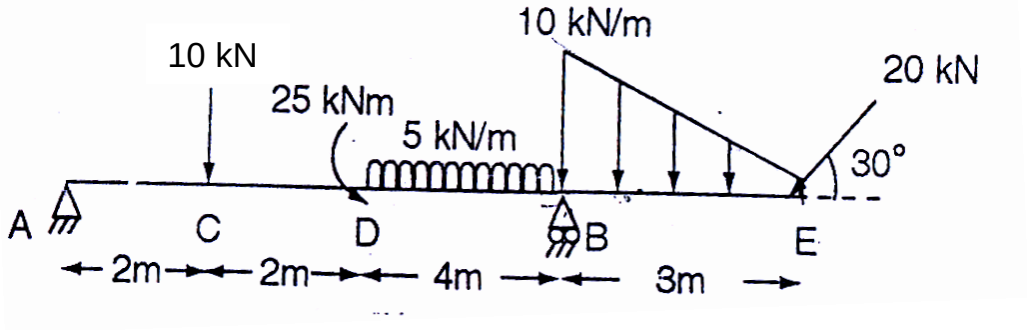


Or

(b) A transmission tower is held by three guy wires anchored by bolts at B, C and D. If the tension in wire AB is 2100 N, determine the components of the force exerted by the wire on the bolt at B. (16)



12. (a) Find the reactions at supports A and B in the given beam. (16)



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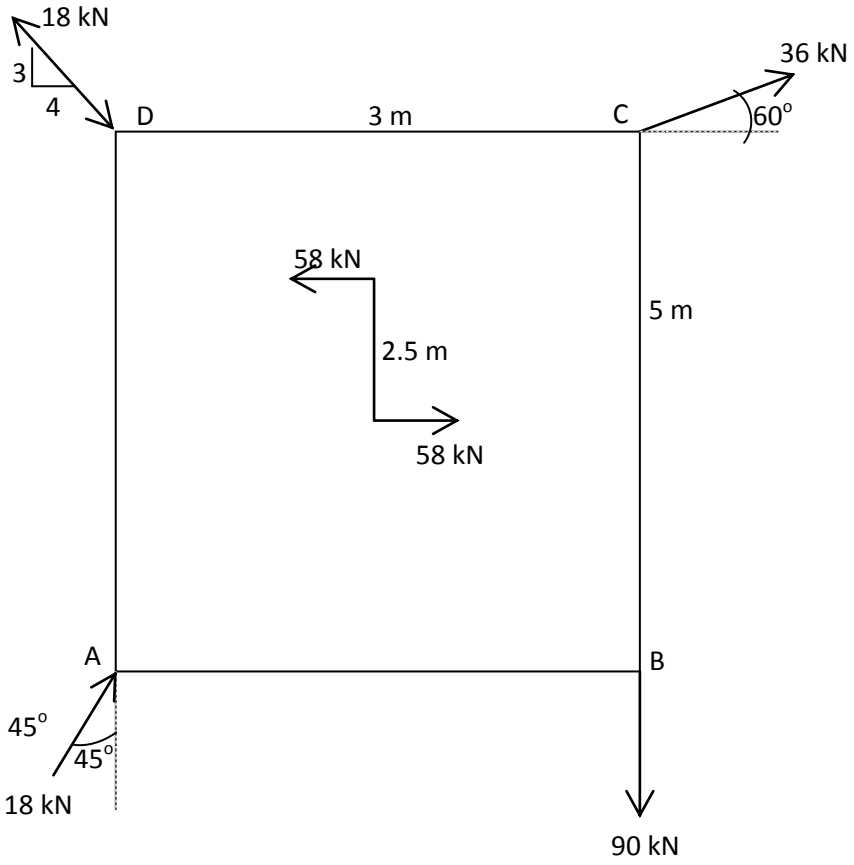
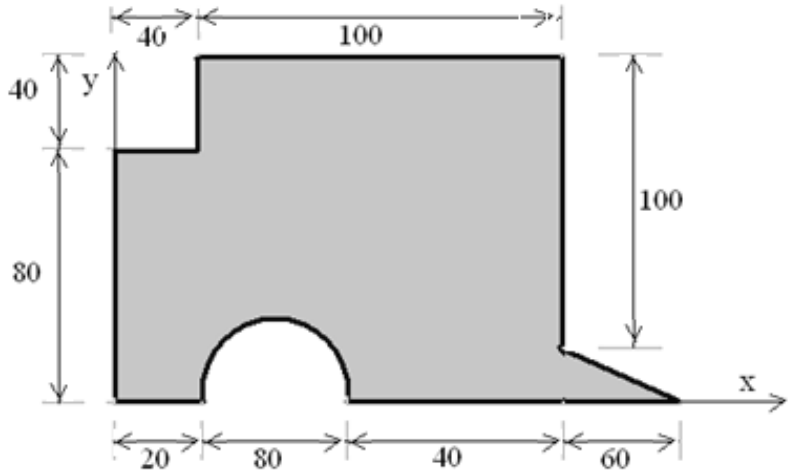
(b) Determine the resultant of the coplanar non-concurrent force system shown in figure. Calculate its magnitude and direction and locate its position with respect to the sides AB and AD. (16)



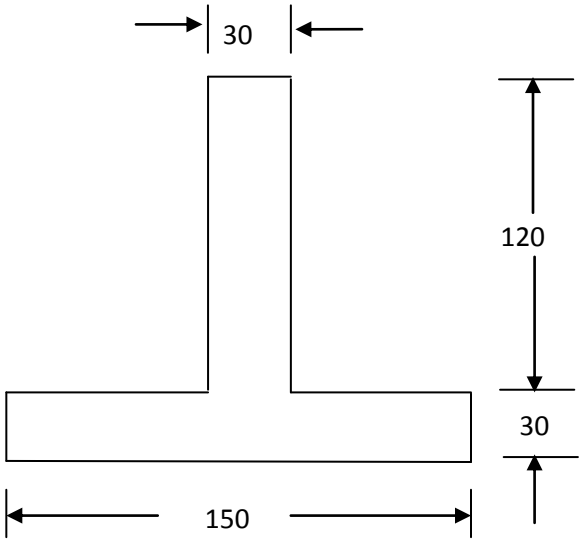
13. (a) Determine the centroid coordinates of the area shown in the figure, with respect to the shown x-y coordinate system. (16)



All dimensions are in mm

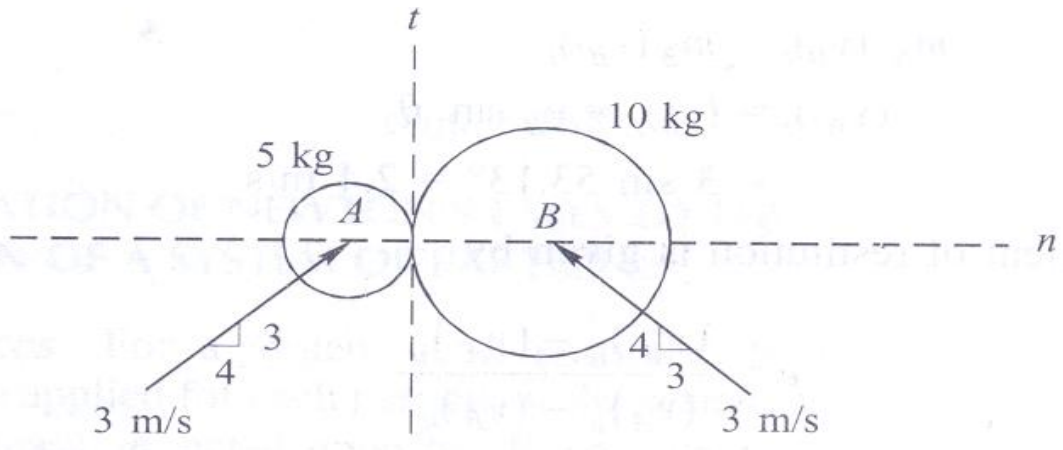
Or

(b) For the section shown in figure, determine the principal moments of inertia and locate the principal axes. (16)



All dimensions are in mm

14. (a) In the oblique central impact shown in fig., the co-efficient of restitution is 0.8. The flat disks shown, slide on a smooth horizontal surface. Determine the final velocity of each disk directly after impact. (16)

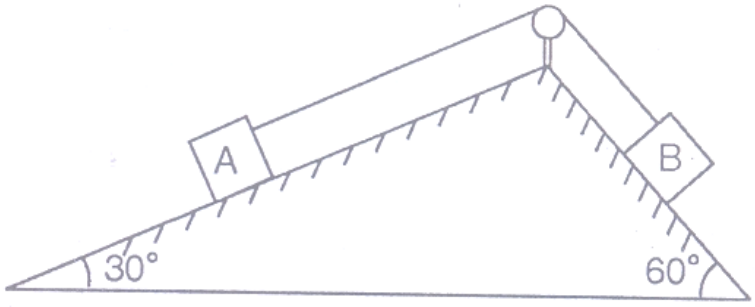


Or

(b) (i) A particle under constant decelaration is moving in a straight line and covers a distance of 20 meters in the first 2 seconds and 40 meters in the next 5 seconds. Calculate the distance it covers in the subsequent 3 seconds and the total distance travelled by the particle before it comes to rest. (8)

(ii) In shot-put game, a man throws an iron ball with an initial velocity of 10 m/s. What should be the angle of projection if he has to reach a record of 10 m? Take the height at which the ball is released as 1.2 m. (8)

15. (a) Two rough planes inclined at 30^0 and 60^0 to the horizontal and of the same height are placed back to back. Masses of 12 kg and 24 kg are placed on the faces and connected by a string passing over the top of the planes. If μ=0.6, find the velocity of block after 5 seconds, starting from rest. (16)



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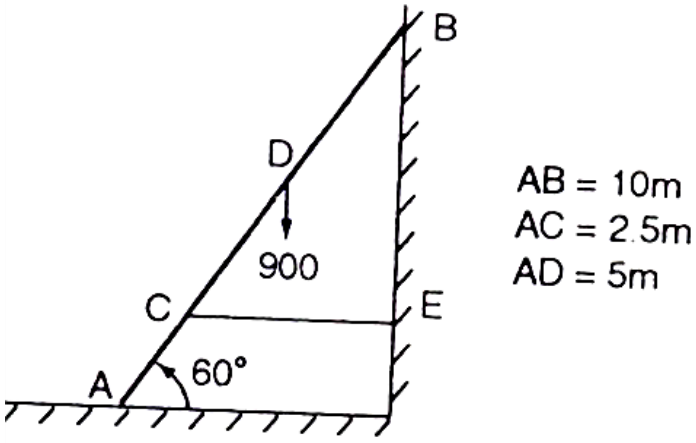
(b) A ladder 'AB' of weight 900 N is held from impending motion towards the right by a rope tied to the wall as shown in figure below. The co-efficient of friction between the floor and ladder is 0.25 and that between the wall and ladder is 0.4. Calculate the tension in rope. (16)