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Question Paper Code: 31735

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Third Semester

Mechanical Engineering

01UME305 – ENGINEERING MECHANICS

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

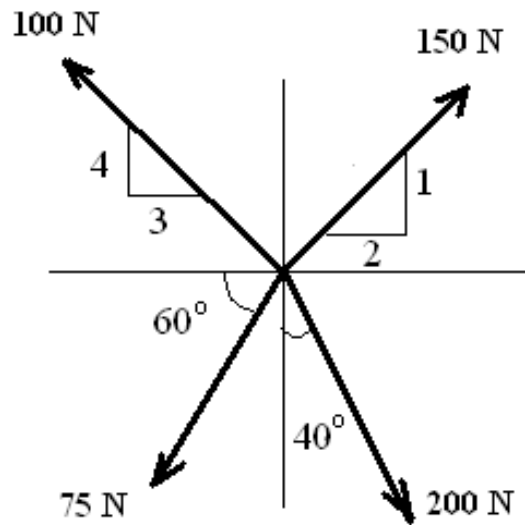
Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. State the principle of transmissibility.
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. State the parallelogram law of forces.
4. Sketch the types of supports with their reactions.
5. State the theorem 1 of Pappus-Guldinus.
6. What is the relationship between area moment of inertia and mass moment of inertia?
7. State work-energy principle for a system of particles.
8. Differentiate kinematics and kinetics.
9. State laws of coloumb friction.
10. What does general plane motion refer to?

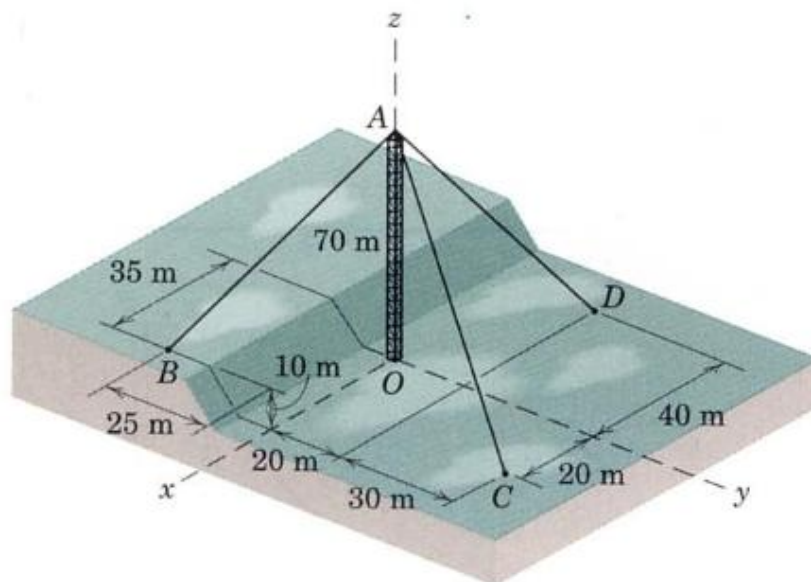
PART - B (5 x 16 = 80 Marks)

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

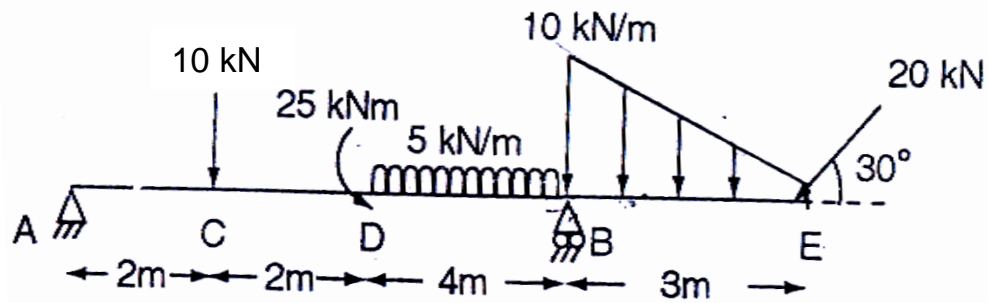


Or

- (b) The 70 m microwave transmission tower is steadied by three guy cables as shown in figure. Cable AB carries a tension of 12 kN. Express the corresponding force on point A as a vector. (16)



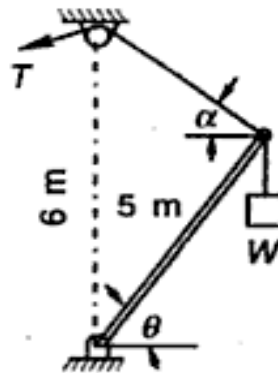
12. (a) Find the reactions at supports A and B in the given beam. (16)



Or

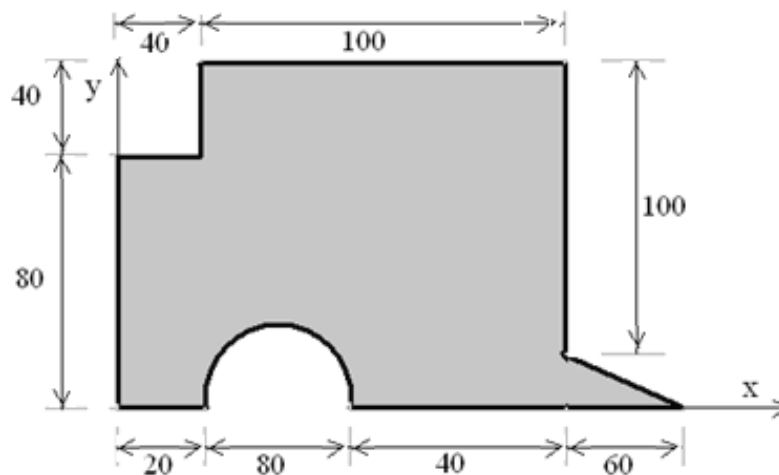
- (b) The boom of a crane is shown in figure. If the weight of the boom is negligible compared with the load $W = 60 \text{ kN}$, find the compression in the boom and also the limiting value of the tension T when the boom approaches the vertical position.

(16)



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

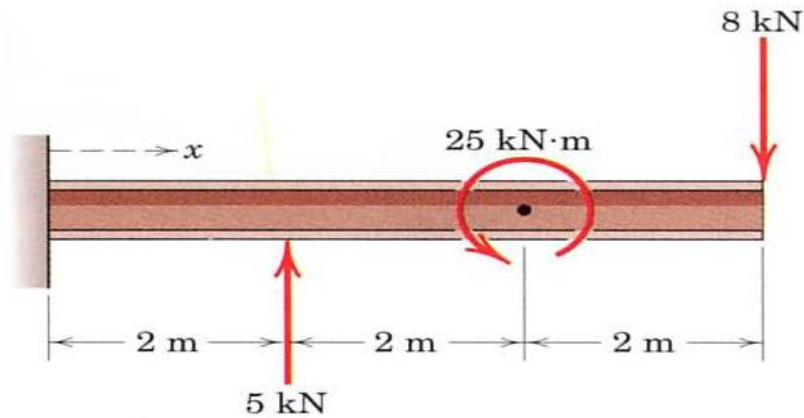
(16)



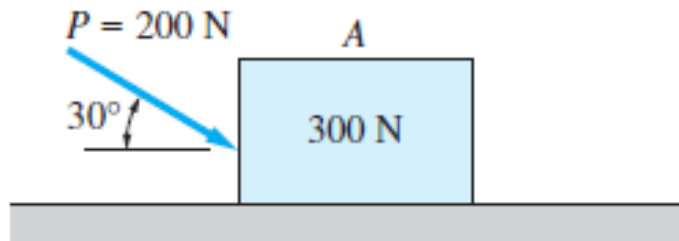
All dimensions are in mm

Or

- (b) Determine and locate the resultant R of the two forces and one couple acting on the I beam shown in figure. (16)

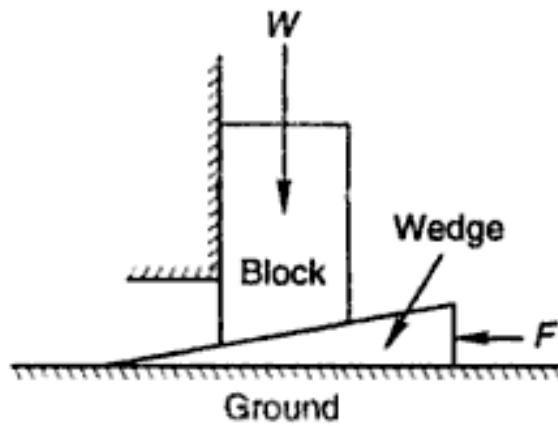


14. (a) The 300N block A as shown in figure is at rest on the horizontal plane when the force P is applied at $t = 0$. Find the velocity and position of the block when $t = 5$ s. The coefficients of static and kinetic friction are 0.2. (16)



Or

- (b) A particle under constant deceleration 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. (16)
15. (a) A block of mass 150 kg is to be raised by means of inserting a 10° wedge weighing 50 kg under it and by applying a horizontal force at it as shown in figure. Assuming the coefficient of friction between all surfaces of contact as 0.3, determine the minimum horizontal force applied to raise the block. (16)



Or

- (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)

