

B.Tech I Year (R13) Supplementary Examinations June 2017
ENGINEERING MECHANICS
 (Common to CE and ME)

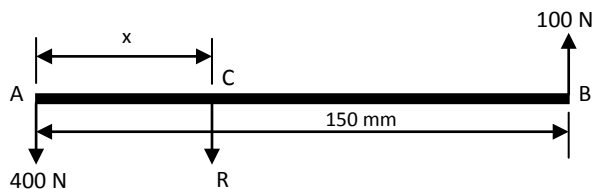
Time: 3 hours

Max. Marks: 70

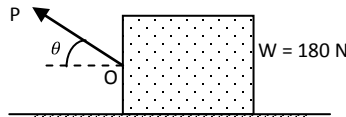
PART – A
 (Compulsory Question)

1 Answer the following: (10 X 02 = 20 Marks)

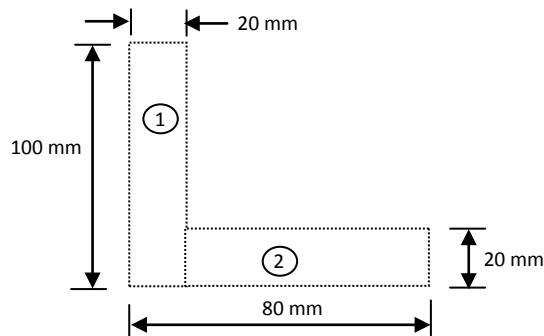
- (a) Two forces of 100 N and 150 N are acting simultaneously at a point. What is the resultant of these two forces, if the angle between them is 45° .
- (b) Two unlike parallel forces of magnitude 400 N and 100 N are acting in such way that their lines of action are 150 mm apart as shown in figure below. Determine the magnitude of the resultant force and the point at which it acts.



- (c) Define "Limiting friction".
- (d) A 180 N block is placed on a rough horizontal surface as shown in figure below. Knowing that block just slides for $P = 60$ N and $\theta = 20^\circ$, determine coefficient of friction.



- (e) Find the centroid of an unequal angle section 100 mm x 80 mm x 20 mm shown in figure below.



- (f) A hemisphere of 60 mm diameter is placed on the top of the cylinder having 60 mm diameter. Find the common centre of gravity of the body from the base of cylinder, if its height is 100 mm.
- (g) An automobile is decelerating from a speed of 65 km/h at the rate of 1.5 m/s^2 . How long will it take to come to rest and how far will it have gone?
- (h) A body is dropped from the top of a tall building. If it takes 2.8 seconds in falling on the ground, find the height of the building.
- (i) A simply supported frame has 8 members and 6 joints, check the frame is perfect or imperfect frame.
- (j) List the general conditions of simple harmonic motion

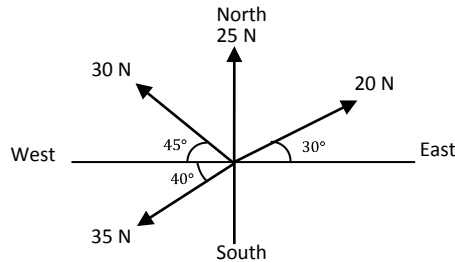
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PART – B

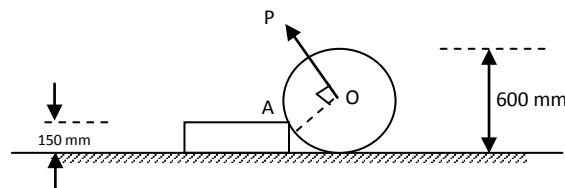
(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

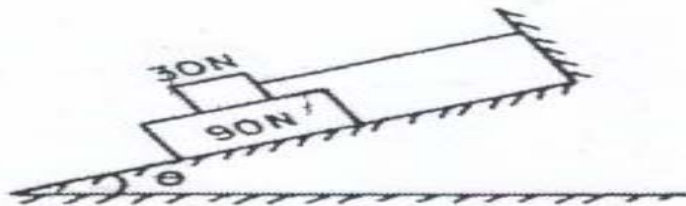
- 2 The following forces act at a point: (i) 20 N inclined at 30° towards North of East. (ii) 25 N towards North. (iii) 30 N towards North West. (iv) 35 N inclined at 40° towards South of West as shown in figure below. Find the magnitude and direction of the resultant force.

**OR**

- 3 A uniform wheel of 600 mm diameter, weighing 5 kN rests against a rigid rectangular block of 150 mm height as shown in figure below. Find the least pull, through the centre of the wheel, required just to turn the wheel over the corner A of the block. Also find the reaction on the block. Take all the surfaces to be smooth.

**UNIT – II**

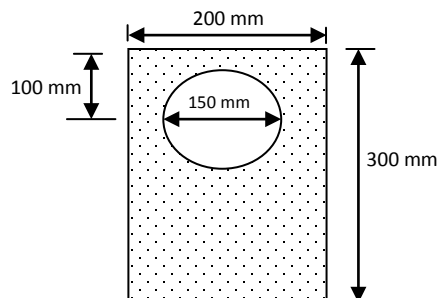
- 4 What should be the value of the angle θ in figure below? So that the motion of the 90 N block impends down the plane? The coefficient of friction μ between the contact surfaces is 0.25.

**OR**

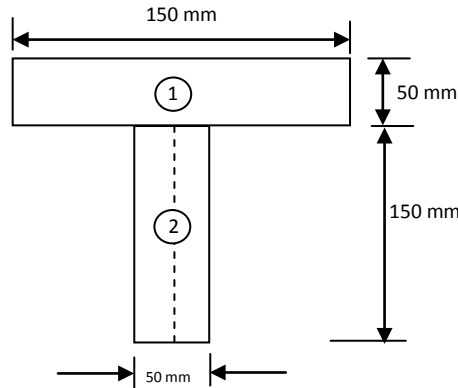
- 5 A screw jack has mean diameter of 50 mm and pitch 10 mm, If the coefficient of friction between its screw and nut is 0.15, find the effort required at the end of 700 mm long handle to raise a load of 10 kN.

UNIT – III

- 6 Find the moment of inertia of a hollow section shown in figure below, about an axis passing through its centre of gravity or parallel X-X axis.

**OR**

- 7 Find the moment of inertia of a T-section with flange as 150 mm x 50 mm and web as 150 mm x 50 mm about X-X and Y-Y axes through the centre of gravity of the section as shown in figure below.

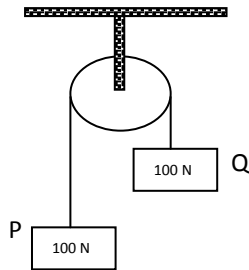


UNIT - IV

- 8 A stone is dropped from the top of a tower 50 m high. At the same time, another stone is thrown upwards from the foot of the tower with a velocity of 25 m/s. When and where the two stones cross each other?

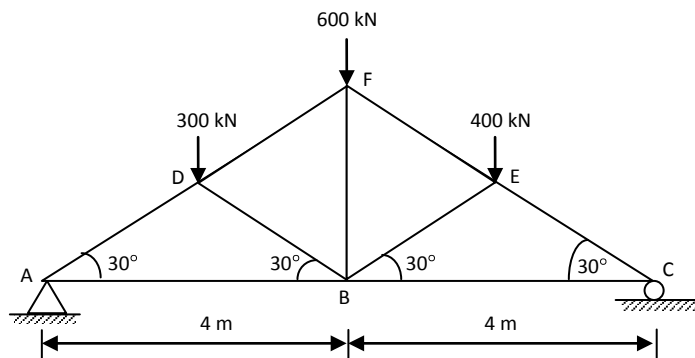
OR

- 9 Block P of weight 100N and block Q of weight 50N are connected by a rope that passes over a smooth pulley as shown in figure below. Find the acceleration of the blocks and the tension in the rope, when the system is released from rest. Neglect the mass of the pulley.



UNIT - V

- 10 Determine the forces in all the members of the frames shown in figure below. Indicate the nature of the forces also.



OR

- 11 Find amplitude and time period of a particle moving with simple harmonic motion, which has a velocity of 9 m/s and 4 m/s at the distance of 2 m and 3 m respectively from the centre.
