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**Question Paper Code: 41375**

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2016

Third Semester

Mechanical Engineering

14UME305 - ENGINEERING MECHANICS

(Regulation 2014)

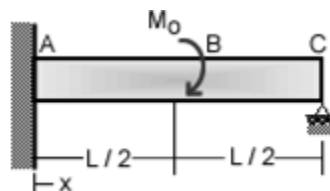
Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Forces are called concurrent when their line of action meet in
  - One point
  - Plane
  - Perpendicular plane
  - Different plane
- A force acting on a body may
  - Introduce internal stresses
  - Balance the other forces acting on it
  - Retard its motion
  - All the above
- If a spanner is 15 cm long and a force of 10 N is applied using this spanner, what is the turning effect of the force in Nm?
  - 150 Nm
  - 66.67 Nm
  - 0.67 Nm
  - 1.5 Nm
- What is the vertical reaction force at point C of this beam?



- 0
- $Mo/2L$
- $Mo/L$
- $3Mo/2L$

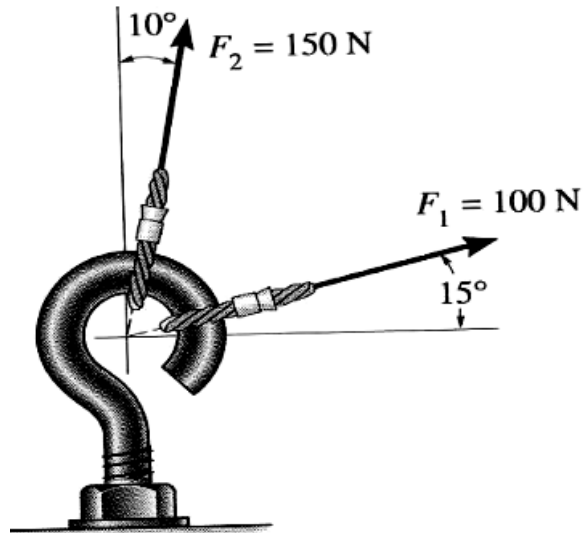
5. Center of gravity of a solid cone lies on the axis at the height
- One-fourth of total height above base
  - One-third of total height above base
  - One-half of total height above base
  - None of these
6. The unit of moment of inertia of the area is
- $kg\text{-}m^2$
  - $m^4$
  - $kg/m^2$
  - $m^3$
7. Two balls of equal mass and of perfectly elastic material are lying on the floor. One of the balls with velocity  $v$  is made to struck the second ball. Both the balls after impact will move with a velocity
- $v$
  - $v/2$
  - $v/4$
  - $v/8$
8. Which of the following is not the unit of energy?
- kcal
  - kg-m
  - Watt hours
  - Watt
9. The ratio of limiting and normal friction is known as
- Coefficient of friction
  - Angle of friction
  - Sliding friction
  - Frictional resistance
10. Frictional force encountered after the commencement of motion is called
- Post friction
  - Kinematic friction
  - Dynamic friction
  - Limiting friction

PART - B (5 x 2 = 10 Marks)

- What is collinear force system?
- Define free body diagram.
- State perpendicular axis theorem.
- Define co-efficient of restitution.
- When a screw is said to be self locking?

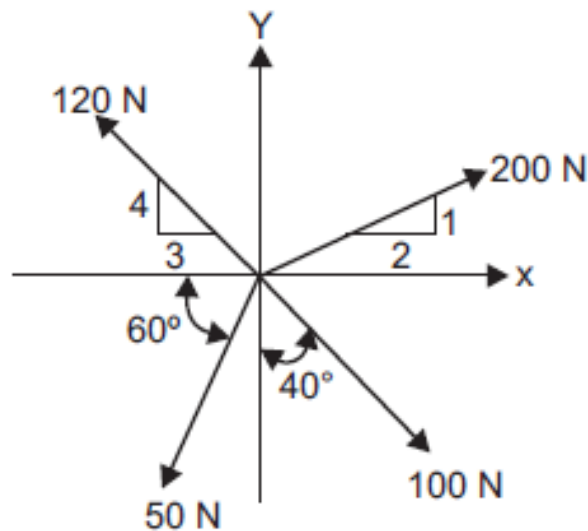
PART - C (5 x 16 = 80 Marks)

16. (a) The screw eye is subjected to two forces  $F_1$  and  $F_2$  as shown in below figure. Determine the magnitude and direction of the resultant force by using analytical method. (16)

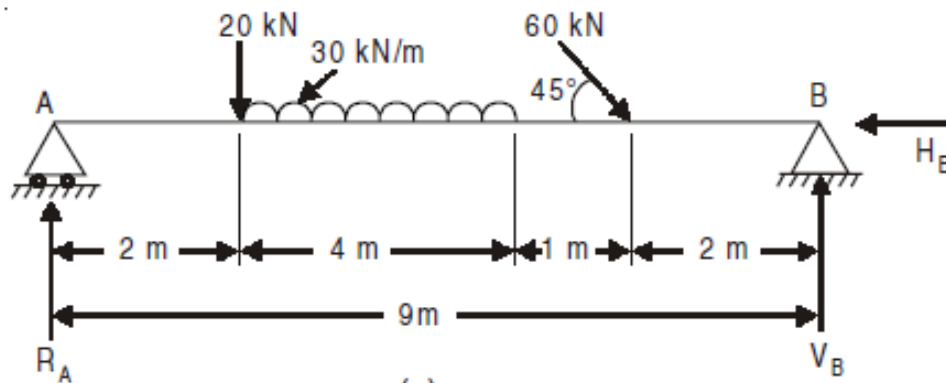


Or

- (b) A system of four forces acting on a body is as shown in below figure. Determine the resultant. (16)

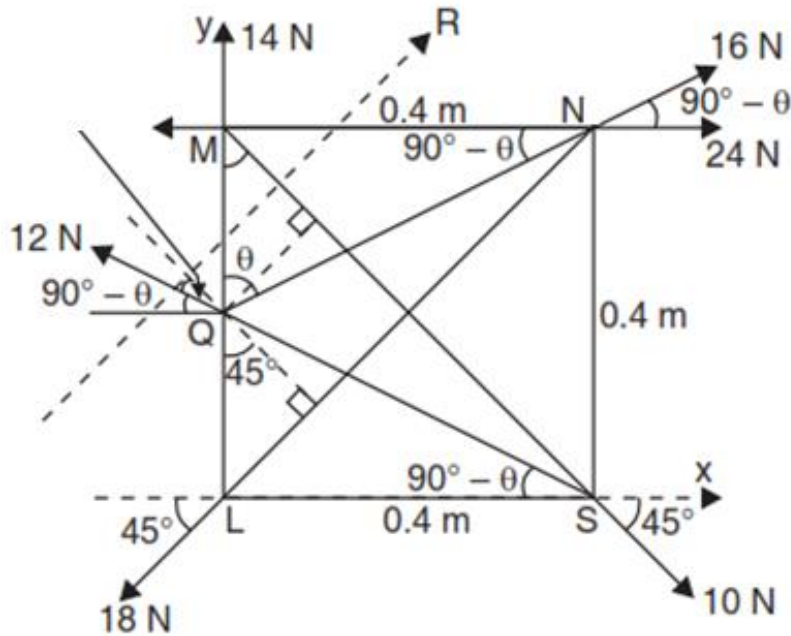


17. (a) Find the reactions at supports A and B of a loaded beam shown in below figure. (16)

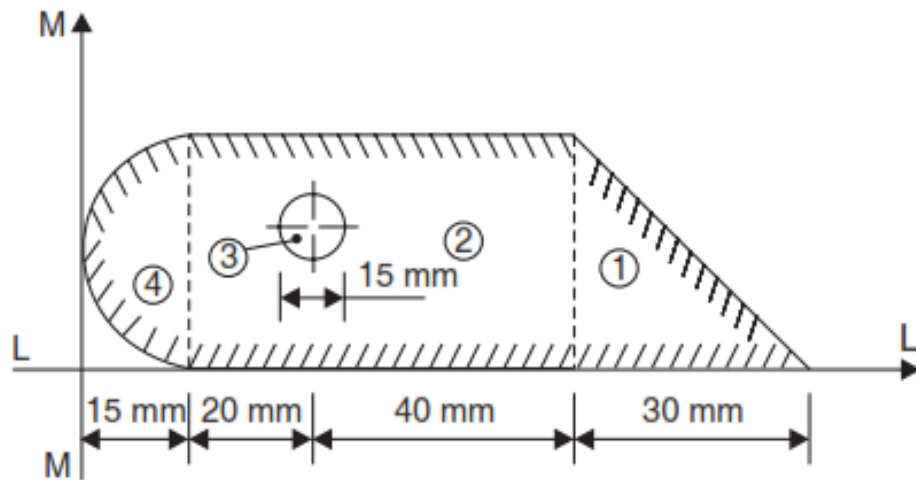


Or

- (b)  $LMNS$  is a square, each side being  $0.4\text{ m}$  and  $Q$  is the middle point of  $LM$ . Forces of  $14, 16, 24, 10, 18$  and  $12\text{ N}$  act in the line of directions  $LM, QN, MN, MS, NL$  and  $SQ$  respectively. Find the magnitude, direction and position of the resultant force. (16)



18. (a) For the shaded area shown in below figure. Find the position of centroid. (16)



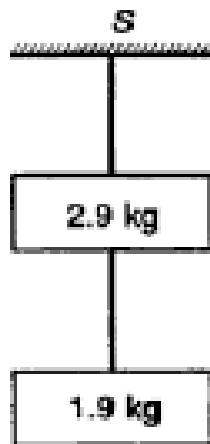
Or

- (b) Derive the equation of mass moment of inertia for a rectangular plate about  $X-X$  axis passing through the C.G. of the plate. (16)

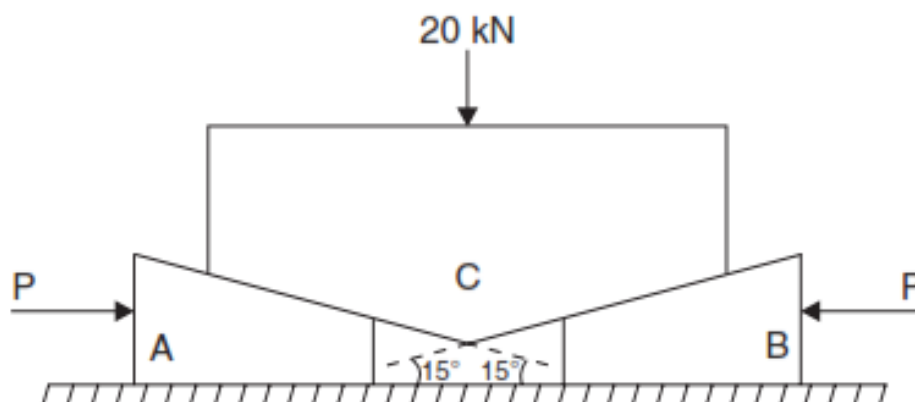
19. (a) A car starts from rest and accelerates uniformly to a speed of  $80 \text{ km/hour}$  over a distance of  $500 \text{ metres}$ . Calculate the acceleration and time taken. If a further acceleration raises the speed to  $96 \text{ km/hour}$  in  $10 \text{ seconds}$ , find the acceleration and further distance moved. The brakes are now applied and the car comes to rest under uniform retardation in  $5 \text{ seconds}$ . Find the distance travelled during the braking. (16)

Or

- (b) Two blocks of mass  $2.9 \text{ kg}$  and  $1.9 \text{ kg}$  are suspended from a rigid support  $S$  by two inextensible wires each of length  $1 \text{ metre}$  shown in below figure. The upper wire has negligible mass and the lower wire has a uniform mass of  $0.2 \text{ kg/m}$ . The whole system of blocks, wires and support have an upward acceleration of  $0.2 \text{ m/s}^2$ . Acceleration due to gravity is  $9.8 \text{ m/s}^2$ . Find the tension at the mid-point of the lower and upper wires. (16)



20. (a) Two wedge blocks  $A$  and  $B$  are employed to raise a load of  $20 \text{ kN}$  resting on another block  $C$  by application of force  $P$  as shown in below figure. Neglecting weights of the blocks and assuming co-efficient of friction  $\mu = 0.25$  for all the surfaces. Determine the value of  $P$  for impending upward motion of block  $C$ . (16)



Or

- (b) The cylinder shown in below figure rolls without slipping on the surface of a conveyor belt which is moving at  $2 \text{ ft/s}$ . Determine the velocity of point A. The cylinder has a clockwise angular velocity  $\omega = 15 \text{ rad/s}$  at the instant shown. (16)

