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

Question Paper Code: 31735

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

Third Semester

Mechanical Engineering

01UME305 - ENGINEERING MECHANICS

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

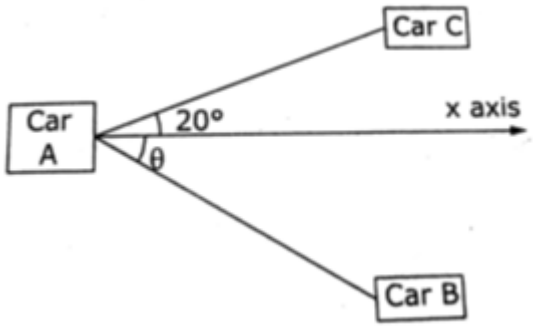
PART A - (10 x 2 = 20 Marks)

1. State the Lami's theorem.
2. Define resolution of forces.
3. Two coplanar concurrent force systems F_1 and F_2 are having angle θ between them, and then what will be the resultant and its direction?
4. Define equilibrant.
5. State varignon's theorem.
6. Define centroid.
7. Define polar moment of inertia.
8. Distinguish between statics and dynamics.
9. State D'Alemberts principle.
10. Define instantaneous center of rotation.

PART - B (5 x 16 = 80 Marks)

11. (a) A car is pulled by means of two cars as shown in figure. If the resultant of the two forces acting on a car A is 40 kN is being directed along the positive direction of

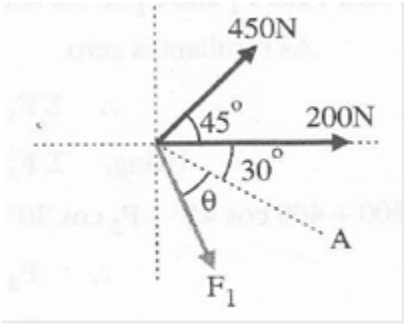
x– axis, determine the angle θ of the cable attached to the car at B, such that the force in the cable AB is minimum. What is the magnitude of force in each cable when it occurs.



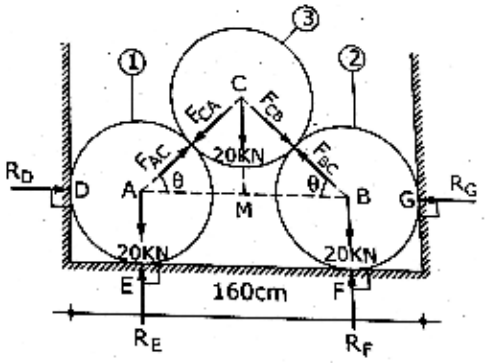
(16)

Or

(b) Three forces act as shown in figure. Determine magnitude and direction θ of F, so that resultant is directed along axis A and has magnitude of 1 *kN*. (16)

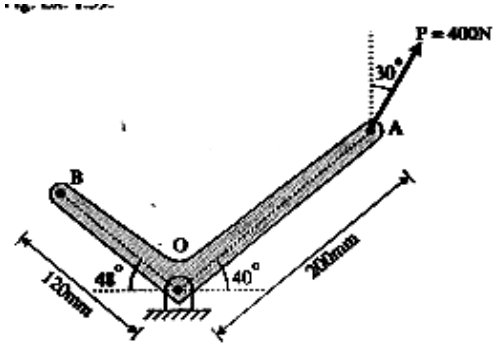


12. (a) Three smooth pipes each weighing 20 kN and of diameter 60 cm are to be placed in a rectangular channel with horizontal base as shown in figure. Calculate the reaction at the point of contact between the pipes and between the channel and the pipes. Take the width of the channel as 160 cm. (16)

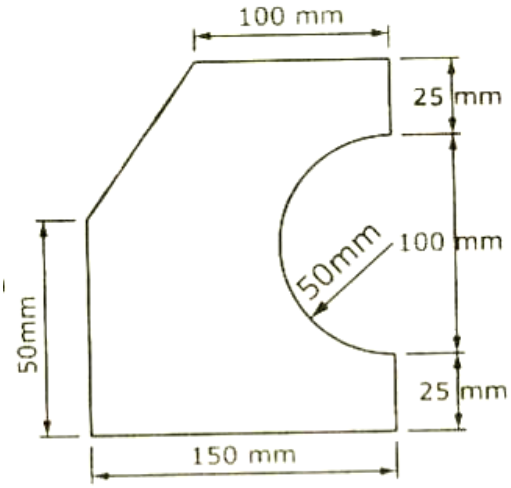


Or

(b) A force of 400 N is acting at point A. (i) Find moment of force about O by resolving it into components along OA and perpendicular to OA, (ii) Determine magnitude and direction of smallest force Q applied at B which has the same moment as P about 'O'. Refer figure. (16)

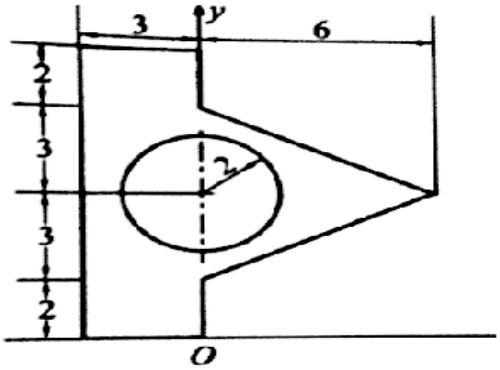


13. (a) Locate the Centroid of the section shown in figure. (16)



Or

(b) Locate the centroid and find the M.I about the base of the component. All Dimensions are in mm. (16)

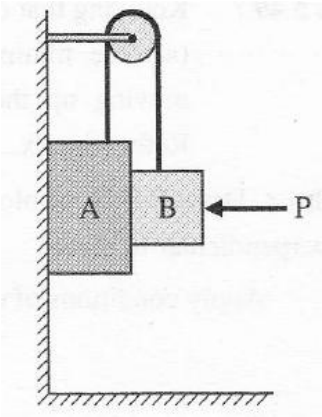


14. (a) The position of a particle which moves along a straight line is defined by the relation $x = t^3 - 6t^2 - 75t + 40$. Where x is in meter and t in sec. Determine:
(a) The time at which the velocity will be zero.
(b) The position and distance travelled by particle at that time.
(c) The acceleration at that time.
(d) The distance travelled by particle from t = 4 sec to t = 6 sec (16)

Or

(b) A bullet of mass 25 gram is moving with a velocity of 500 m/s and fired into a body of 12 kg, which is suspended by a string, fixed at top, 1 m long. The bullet gets embedded into the body and the unit (ie, bullet + body) swings through some angle. Find out the angle through which the unit swings. (16)

15. (a) Block A of mass 12 kg and block B of mass 6 kg are connected by a string passing over a smooth pulley. If $\mu = 0.12$ at all surfaces of contact find smallest value of force P to maintain equilibrium. Refer figure? (16)



Or

(b) Figure shows a four-bar mechanism. If the crank O_1A rotates with an angular velocity of 150 rpm in the clockwise direction, determine the angular velocities of links AB and O_2B for the position. (16)