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

Question Paper Code: 33705

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Third Semester

Mechanical Engineering

01UME305 – ENGINEERING MECHANICS

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

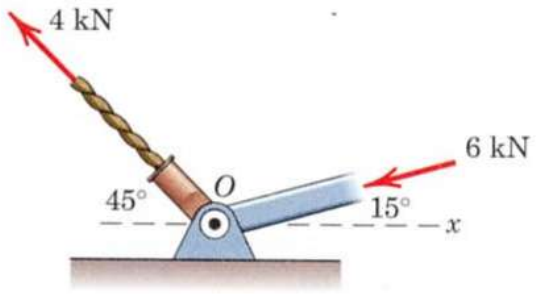
Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. State the Lami's theorem.
2. Define resolution of forces.
3. State the parallelogram law of forces.
4. Sketch the types of supports with their reactions.
5. State varignon's theorem.
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?

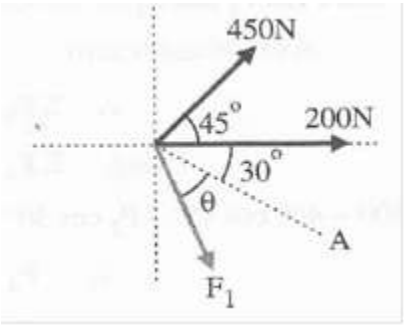
PART - B (5 x 16 = 80 Marks)

11. (a) The two structural members as shown in Figure, one of which is in tension and the other in compression, exert the indicated force on joint *O*. Determine the magnitude of the resultant *R* of the two forces and the angle θ which *R* makes with the positive *x*-axis. (16)

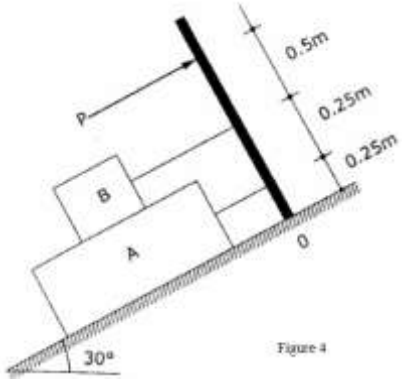


Or

(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)

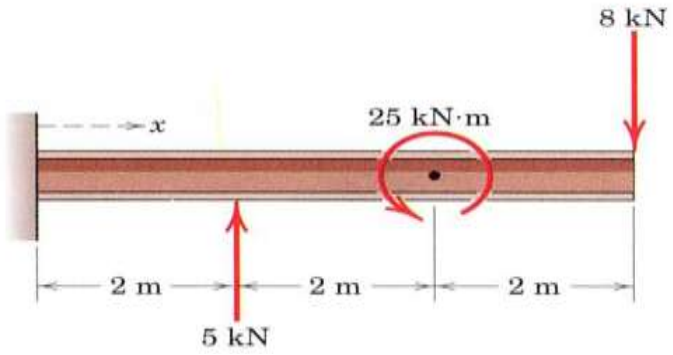


12. (a) Blocks *A* and *B* of weight 200*N* and 100*N* respectively, rest on a 30° inclined plane and are attached to the post which is held perpendicular to the plane by force *P*, parallel to the plane, as shown in figure 4. Assume that all surfaces are smooth and that the cords are parallel to the plane. Determine the value of *P*. Also find the Normal reaction of Blocks *A* and *B*. (16)

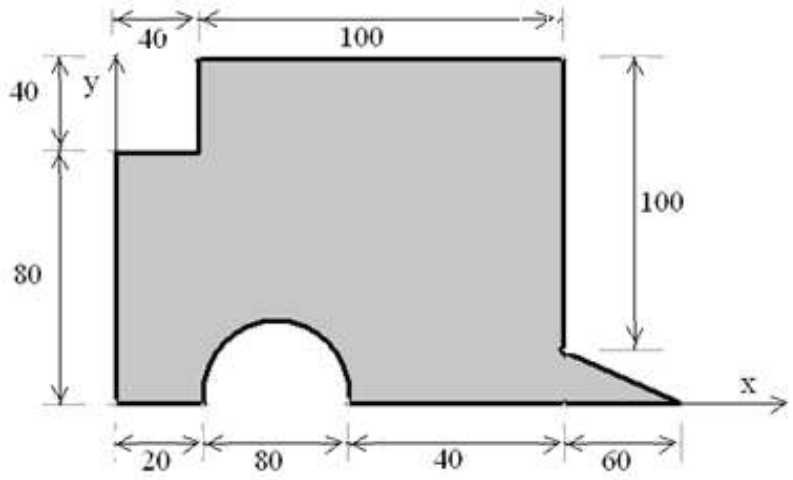


Or

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



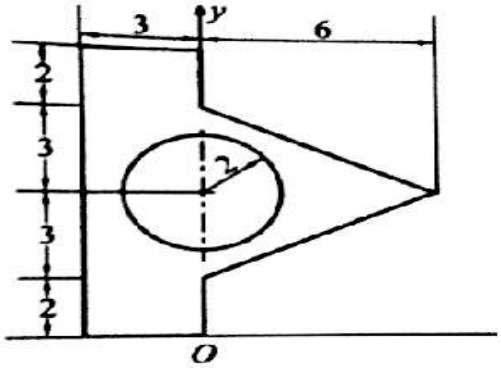
13. (a) Determine the centroid coordinates of the area shown in the figure, with respect to the shown x-y coordinate system. (16)



All dimensions are in mm

Or

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

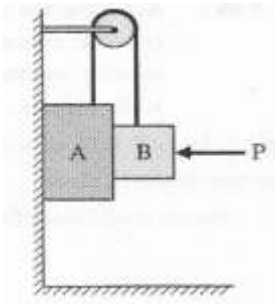


14. (a) The position of a particle which moves along a straight line is defined by the relation $x = t^3 - 6t^2 - 75t + 40$. Where x is in meter and t in sec.
Determine:
(a) The time at which the velocity will be zero.
(b) The position and distance travelled by particle at that time.
(c) The acceleration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

Or

(b) A 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. (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) Find the force P inclined at an angle of 32° to the inclined plane making an angle of 25° with the horizontal plane to slide a block weighing 125 *kN* (i) up the inclined plane (ii) down the inclined plane, when $\mu = 0.5$. (16)