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

Question Paper Code: 33075

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

Third Semester

Mechanical Engineering

01UME305 – ENGINEERING MECHANICS

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

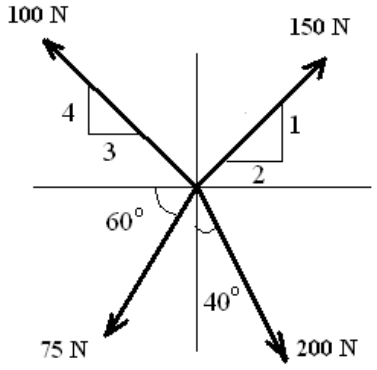
Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. State the principle of transmissibility.
2. Distinguish the following system of forces with a suitable sketch. (a) Coplanar (b) Collinear.
3. State the parallelogram law of forces.
4. State Varignon's theorem.
5. Locate the centroid and calculate the moment of inertia about centroidal axes of a semicircular lamina of radius 2*m*.
6. Write the significance of mass moment of inertia.
7. Define impulse and impulsive force.
8. Differentiate kinematics and kinetics.
9. State laws of coloumb friction.
10. Define Limiting friction.

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) A force *P* is applied at '*O*' to the string *AOB* as shown in figure1 If the tension in each part of string is 50 *N*, find the direction an magnitude of force *P* for equilibrium conditions. (16)

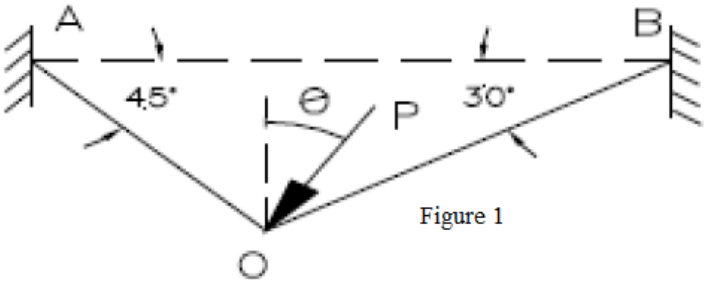


Figure 1

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)

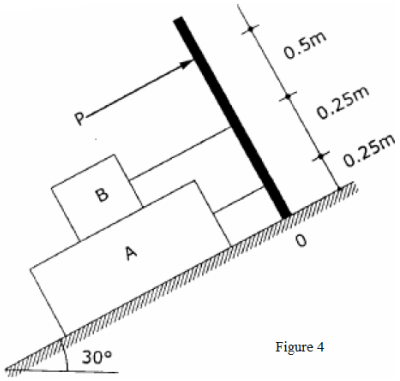
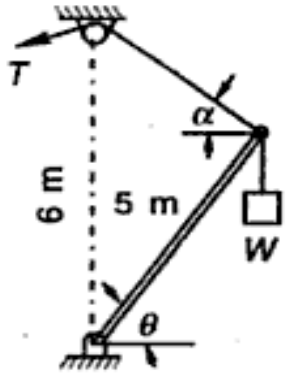


Figure 4

Or

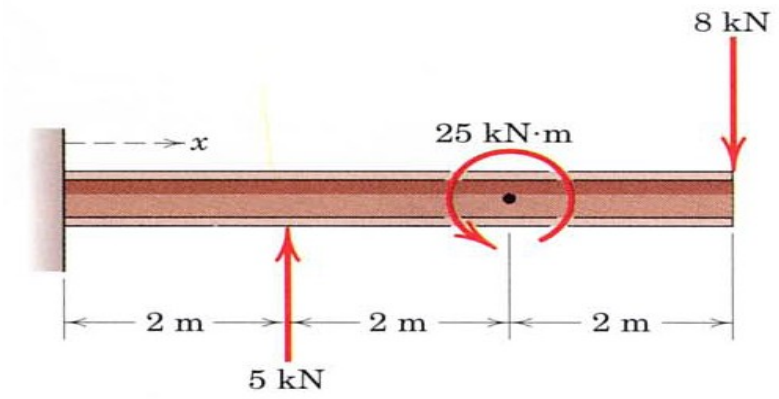
(b) The boom of a crane is shown in figure. If the weight of the boom is negligible compared with the load $W = 60\ kN$, find the compression in the boom and also the limiting value of the tension T when the boom approaches the vertical position. (16)



13. (a) Derive an expression for mass moment of inertia of prism along three axes. (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)



14. (a) The position of the particle is given by the relation $S=1.5t^3-9t^2-22.5t+60$, where S is expressed in meters and t in seconds. Determine (i) the time at which the velocity will be zero (ii) the position and distance traveled by the particle at that time (iii) the acceleration of the particle at that time and (iv) the distance traveled by the particle from $t = 5s$ to $t = 7s$. (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) A flywheel has an initial velocity of 15 *rad/sec* and a constant angular acceleration of 4 rad/sec^2. Determine the number of revolutions it must undergo to attain an angular velocity of 20 *rad/sec*. Also find the time required. (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)

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