R09

Code No: 51003

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, May/June – 2019
ENGINEERING MECHANICS
(Common to CE, ME, CHEM, AE)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) Differentiate between moment of a force and a couple.
b) Draw FBD of a sphere placed on a 30^0 incline and supported by a vertical wall.
c) A force of 100N makes angles of 30^0, 60^0 and 100^0 with x, y, z axes respectively. Find the components of the force along the x, y and z axes. [5+5+5]

2.a) State and prove Lami's theorem.
b) Determine the resultant of the parallel coplanar force system shown in figure 1. [7+8]

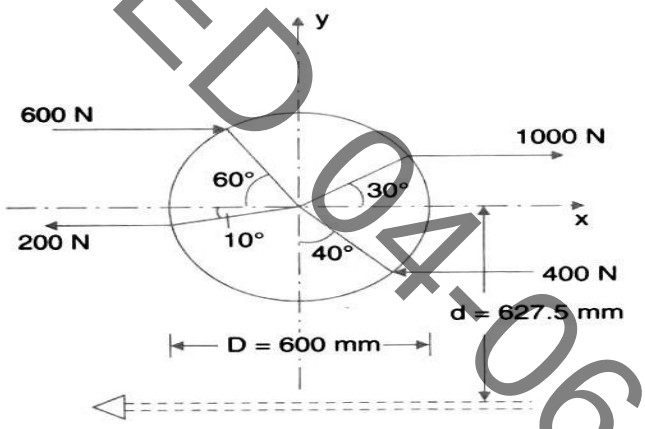

Figure: 1

3.a) Distinguish between centre of gravity and centroid.
b) With respect to the coordinate axes x and y locate the centroid of the shaded area shown in figure 2. [7+8]

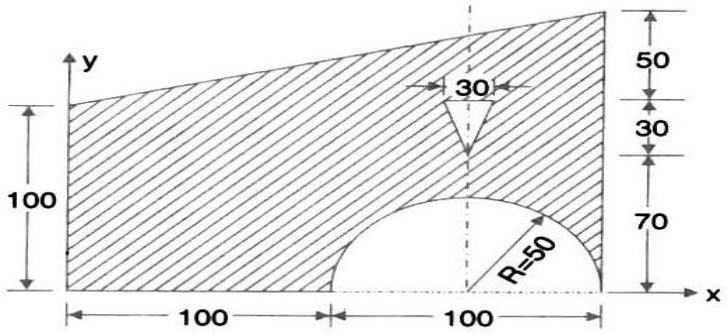

Figure: 2

4. Find the mass moment of inertia of a solid cone of height h and base radius R about:
a) Its axis of rotation and
b) An axis through vertex normal to the axis of rotation. [7+8]

5. Determine the forces in all the members of the trusses shown in figure 3. Indicate the nature of forces using the convention tension as +ve and compression as –ve. [15]

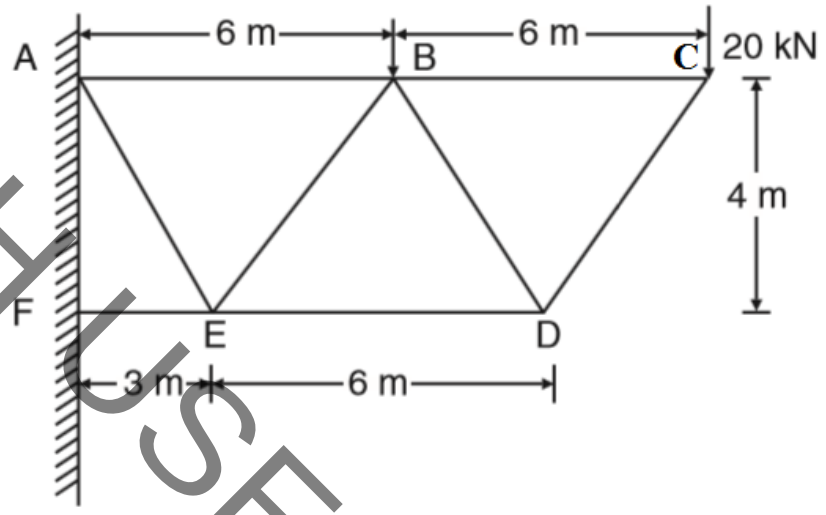

Figure: 3

6.a) Define the terms velocity of projection and angle of projection.

b) Two cars are travelling towards each other on a single lane road at the velocities 12 m/sec and 9 m/sec respectively. When 100 m apart, both drivers realise the situation and apply their brakes. They succeed in stopping simultaneously and just short of colliding. Assume constant deceleration for each case determine:
i) Time required for car to stop.
ii) Deceleration of each car.
iii) The distance travelled by each car while slowing down. [7+8]

7.a) Explain the term conservation of energy.

b) A block weighing 2500N rests on a level horizontal plane for which coefficient of friction is 0.20. This block is pulled by a force of 1000N acting at an angle of 30^0 to the horizontal. Find the velocity of the block after it moves 30m starting from rest. If the force of 1000N is then removed, how much further will it move? Use work energy method. [7+8]

8.a) What is virtual work, principle of virtual work and its applications.

b) A beam AB of span 8 m carries two point loads of 10 kN and 15 kN at 3 m and 5 m from the end A respectively. Determine the beam reactions by the principle of virtual work. [7+8]

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