Code No: 51003 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, May - 2018
ENGINEERING MECHANICS
(Common to CE, ME, MMT, AE, AME, MIE)

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

Answer any five questions
All questions carry equal marks

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1.a) Define the terms Resultant and Equilibriant.
b) What is a couple? What is the arm of a couple and its moment?
c) Find the magnitude, direction and position of the resultant force for a given system of forces as shown in the figure 1 below. [15]

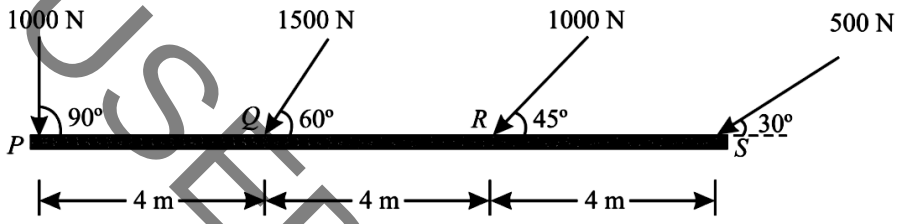

Figure: 1

2.a) State and Prove Lami's Theorem.
b) The frictionless pulley A shown in figure 2 is supported by two bars AB and AC which are hinged at B and C to a vertical wall. The flexible cable DG hinged at D, goes over the pulley and supports a load of 20 kN at G. The angles between the various members are shown in the figure. Determine the forces in the bars AB and AC. Neglect the size of the pulley. [7+8]

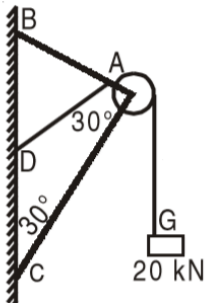

Figure: 2

3.a) What is centroid and centre of gravity? State the differences clearly.
b) Determine the centroid of the area shown in the figure 3 by considering b-b as x-axis and a-a as y-axis. [7+8]

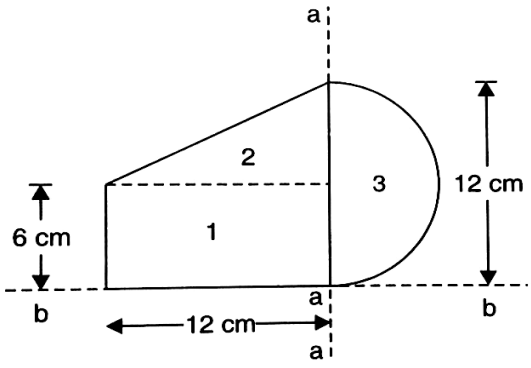

Figure: 3

4.a) What is parallel axis theorem related to moments of area? Illustrate it with the help of a suitable sketch.

b) Determine the moment of inertia of a hollow sphere of radii R_1 and R_2, and determine the radius of gyration of a solid sphere. [7+8]

5.a) Classify trusses with reference to their process of formation.

b) Below figure 4 shows a cantilever truss having a span of 4.5 metres. It is hinged at two joints to a wall and is loaded as shown. Find the reactions and forces in the members of the truss. [7+8]

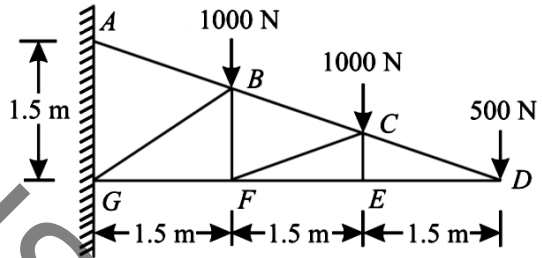

Figure: 4

6.a) State the difference between curvilinear motion and rotary motion.

b) A bullet moving at the rate of 200 m/s is fired into a log of wood. The bullet penetrates to a depth of 50 cm. if the bullet moving with the same velocity is fired into a similar piece of wood 25 cm thick, with what velocity it would emerge. Take the resistance to be uniform in both the case. [7+8]

7. A block weighing 2500 N rests on a level horizontal plane for which coefficient of friction of 0.2. This block is pulled by a force of 1000 N acting at an angle of 30^0 to the horizontal. Find the velocity of the block after it moves 30 m starting from rest. If the force of 1000 N is then removed, how much further will it move? Use work energy method. [15]

8.a) Explain (i) virtual rotation and (ii) virtual displacement.

b) A uniform ladder, 5 metres long and weighing 200 N, rests on a smooth floor at A and against a smooth wall at B as shown in figure 5. A horizontal rope PQ prevents the ladder from slipping. Using the method of virtual work, determine the tension in the rope. [7+8]

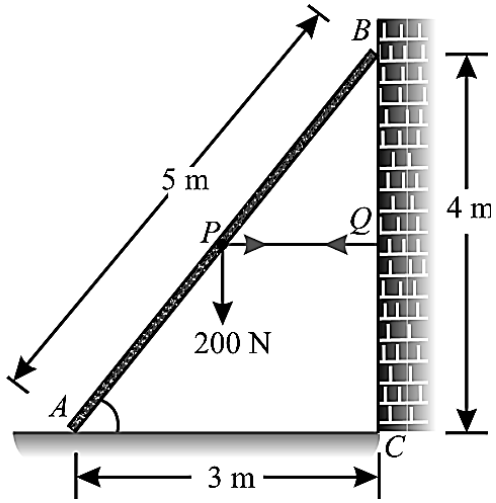

Figure: 5

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