JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech I Year Examinations, December-2014/January-2015
ENGINEERING MECHANICS
(Common to CE, ME, CHEM, MCT, MMT, AE, AME, MIE, PTE, MSNT, AGE)

Time: 3 hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks

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1.a) State and explain the equations of equilibrium for system of coplanar concurrent force system.

b) Two forces equal to 2F and F act on a particle. If the first be doubled and the second increased by 15 N, the direction of the resultant remains unaltered. Find the value of F.

2.a) Differentiate between the statically determinate structures and statically indeterminate structures with examples.

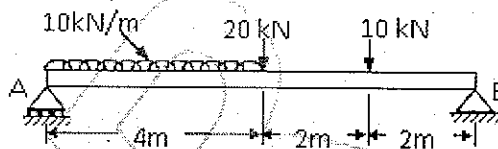b) Determine the support reactions for the following beam as shown in figure 1.

Figure: 1

3.a) Determine the centroid of a Quarter circular Arc of radius 'r'.

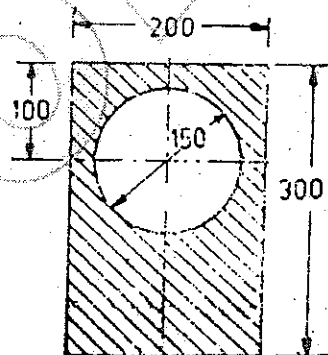b) Locate the centroid of the shaded area shown in figure 2 with dimensions in mm.

Figure: 2

4.a) State and prove the parallel axis and perpendicular axis theorems.

b) Derive the expression for mass moment of inertia of a circular lamina of radius 'r' and mass per unit area is 'm'.

5.a) State the mathematical condition for rigid or perfect truss.

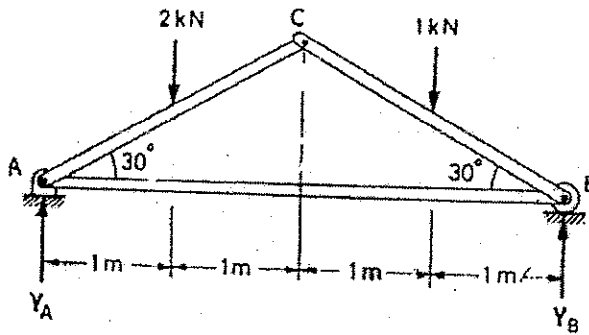b) A frame ABC is loaded and supported as shown in figure 3 below. Find the force in the bar AB.

Figure: 3

6.a) A passenger train passes a certain station at 60 km/hr and covers a distance of 12 km with this speed and then stops at the next station 15 km from the first with uniform retardation. A local train starting from the first station covers the same distance in double this time and stops at the next station. Determine the maximum speed of the local train which covers a part of the distance with uniform acceleration and the rest with uniform retardation.

b) A soldier fires a bullet with a velocity of 31.32 m/s at an angle α upwards from the horizontal from his position on a hill to strike a target which is 100 m away and 50 m below his position. Find the angle of projection α. Find also velocity with which the bullet strikes the object.

7.a) Explain the impulse-momentum method.

b) Two blocks of weight 200 N and 300 N are placed on the planes and are connected by a cord passing over a frictionless pulley. If the coefficient of friction between the planes and blocks is 0.3 as shown in figure 4, find the distance the block W_B attain the final velocity of the 4 m/s starting from rest. What is the tension in the cord?
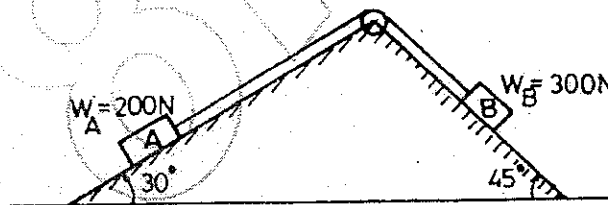

Figure: 4

8.a) Write the applications of principle of virtual work.

b) Two uniform rods each of length 'l' and weight 'w' are connected as shown in figure 5 below. Using the method of virtual work determine θ_1 and θ_2 corresponding to the equilibrium of the bars.
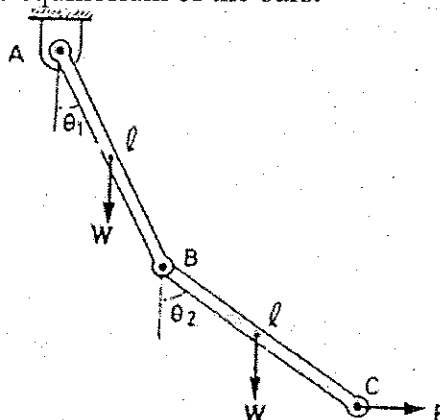

Figure: 5