Code.No: R09A1BS05 | R09 | SET-1

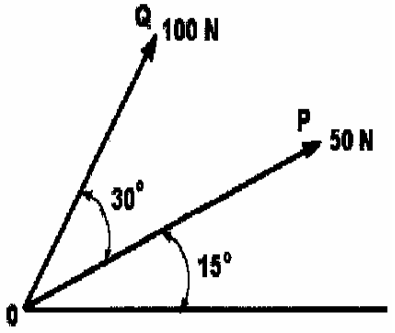
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
I B.TECH – REGULAR EXAMINATIONS, JUNE - 2010
ENGINEERING MECHANICS
(COMMON TO CE, ME, CHEM, MECT, MMT, MEP, AE, AME)

Time: 3hours **Max.Marks:80**

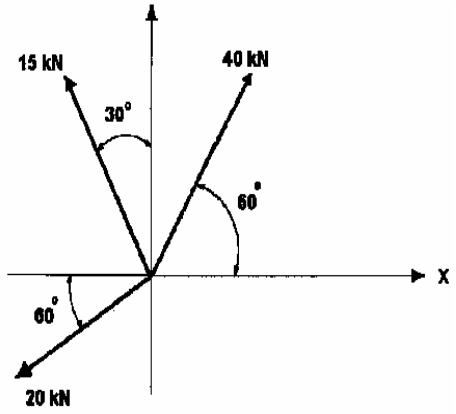
Answer any FIVE questions
All questions carry equal marks

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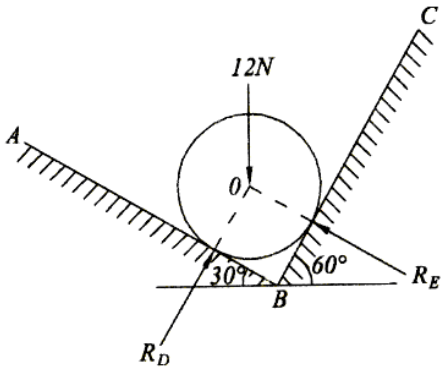
1.a) Two forces are acting at a point O as shown in figure. Determine the resultant in magnitude and direction of the force.



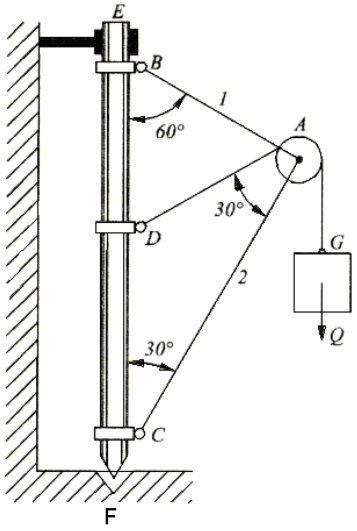
b) Three forces of magnitude 40 kN, 15 kN and 20 kN are acting at a point O as shown in figure. The angles made by 40 kN, 15 kN and 20 kN forces with X-axis are 60^0, 120^0 and 240^0 respectively. Determine the magnitude and direction of the resultant force. [7+8]



2. a) A ball of weight Q = 12 N rests in a right - angled trough, as shown in figure. Determine the forces exerted on the sides of the trough at D and E if all surfaces are perfectly smooth.

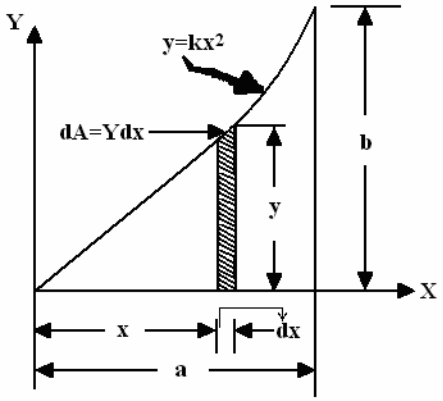


b) A pulley A is supported by two bars AB and AC which are hinged at points B and C to a vertical mast EF as shown in figure. Over the pulley hangs a flexible cable DG which is fastened to the mast at D and carries at the other end G a load Q = 20 kN. Neglecting friction in the pulley, determine the forces produced in the bars AB and AC. The angles between the various members are as shown in the figure. [7+8]



3.a) What is centroid and center of gravity? State the differences clearly.

b) Determine the centroid of the parabolic spandrel as shown in figure. [6+9]

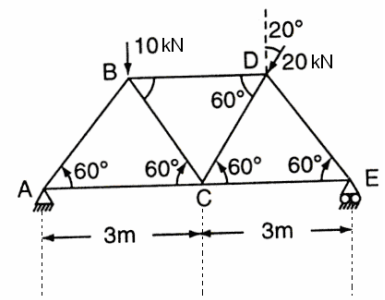


4.a) State and prove parallel axis theorem of area moment of inertia.

b) Determine the product of inertia of a rectangle of base 'a' and height 'h' about x axis and y axis by direct integration. [6+9]

5.a) What are the assumptions made for forces in members of a perfect frame?

b) Find the forces in all the members of the truss as shown in the figure using method of joints. [4+11]



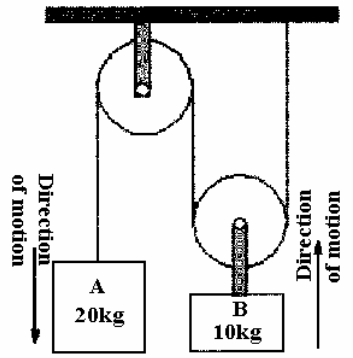
6.a) Derive the equations of motion of a particle with uniform acceleration.

b) Two bodies of weight 20 N and 10 N are connected to the two ends of a light inextensible string, passing over a smooth pulley. The weight of 20 N is placed on a horizontal surface while the weight of 10 N is hanging free in air. The horizontal surface is a rough one, having coefficient of friction between the weight 20 N and the plane surface equal to 0.3, determine:

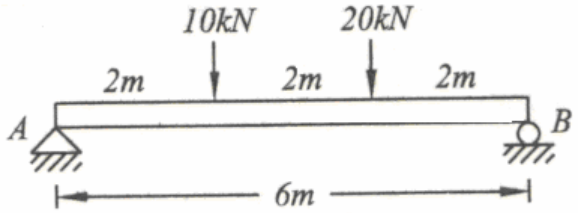
i) The acceleration of the system.

ii) The tension in the string. [7+8]

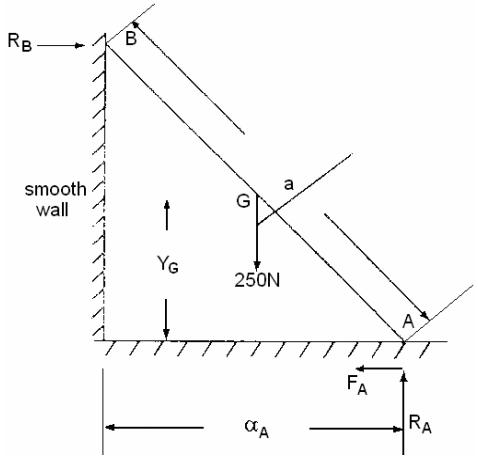
7. In the pulley system shown in figure the masses of blocks A and B are 20 kg and 10 kg respectively. The masses of pulley and rope may be neglected. Find the velocity of the blocks 5 sec after they start from rest. [15]



8.a) Determine the reactions at supports as shown in figure using the principle of virtual work.



b) A uniform ladder of weight 250 N as shown in the figure rests with its upper end against a smooth vertical wall and its foot on a rough horizontal ground making an angle of 45^0 with the ground. Find the force of friction of the ground using the method of virtual work. [7+8]



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