Roll No-

B.Tech Food Technology
I Semester Examination 2017
Course Code- BFTC -106
Course Title – Engineering Mechanics

Time: 3 Hours Max. Marks: 70

Note:
1. *It is compulsory to answer the questions of Section -A. Limit your answers within 20-40 word in this part.*
2. *Answer any four questions from Section -B.*
3. *Different parts of the same question are to be attempted adjacent to each other.*
4. *Assume suitable standard data wherever required, if not given*
5. *Calculator is allowed.*

SECTION –A (5x6 = 30 Marks)

Q1 (a) Define lami's theorem (3)

(b) Bring out the differences among perfect, deficient and redundant trusses. (3)

Q2 (a) A ball of weight 120N rest in a right angled groove as shown in following Fig. 1. The sides of the groove are inclined to an angle of 30^0 & 60^0 to the horizontal. If all the surfaces are smooth then determine the reactions at A & C at the points of contact (3)

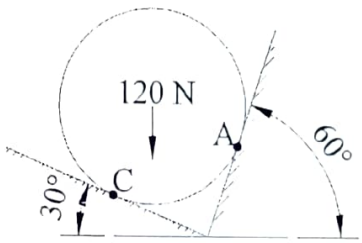

Figure 1

(b) Using method of joints, determine the forces in each member of truss shown in Fig 2. (3)

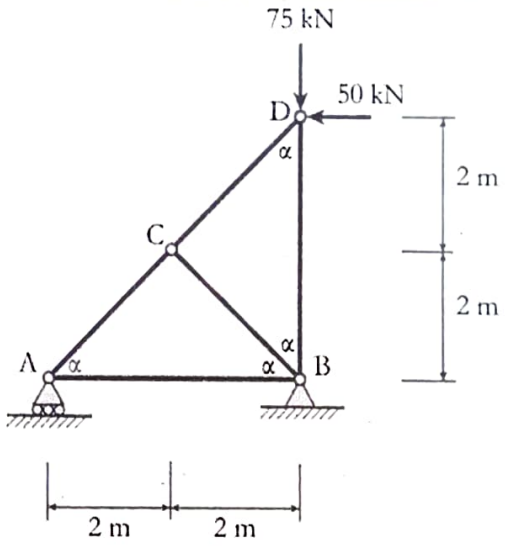

Figure 2

Q3 Two rectangular blocks of weight $W_1 = 150N$ and $W_2 = 100N$ are connected by a string and rest on an inclined plane and on a horizontal surface as shown in following Fig. 3. The coefficient of friction for all contiguous surfaces is $\mu = 0.2$. Find the magnitude and direction of the least force P at which the motion of the blocks will impend. (6)

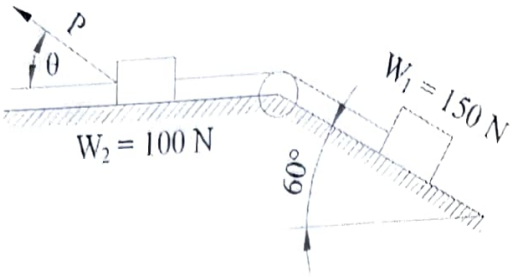

Figure 3

Q4 The car in Fig. 4. moves in a straight line such that for a short time its velocity is define by $v = (3t^2+2t)$ m/s, where t is in seconds. Determine its position and acceleration when t = 3s. When t =0, s = 0 (6)

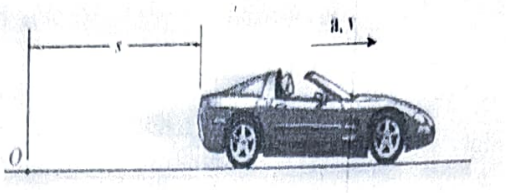

Figure 4

Q5 Find moment of inertia of the shaded area shown in the Fig. 5 about the axis AB (6)

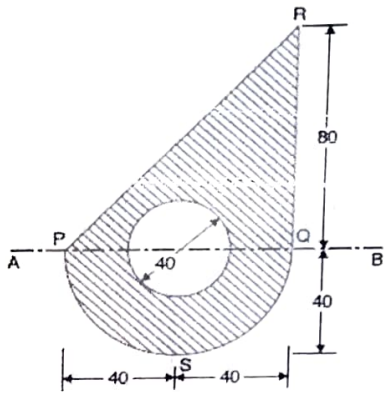

Figure 5

SECTION-B (4x10 = 40 Marks)

Q1 A 1000 N cylinder is supported by a horizontal rod AB and a smooth uniform rod CD which weighs 500 N as shown in Fig. 6. Assuming the pins at A, B, C and D, to be frictionless and weight of AB negligible, find the reactions at C and D. (10)

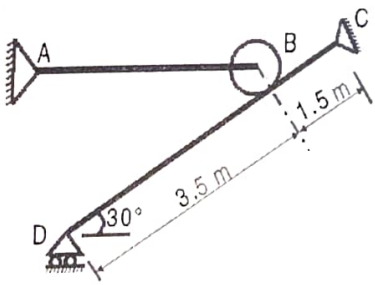

Figure 6

Determine the moment of inertia of the section shown in Fig. 7. about an axis passing through the centroid and parallel to the top most fibre of the section. Also determine moment of inertia about the axis of symmetry. Hence find radii of gyration. (10)

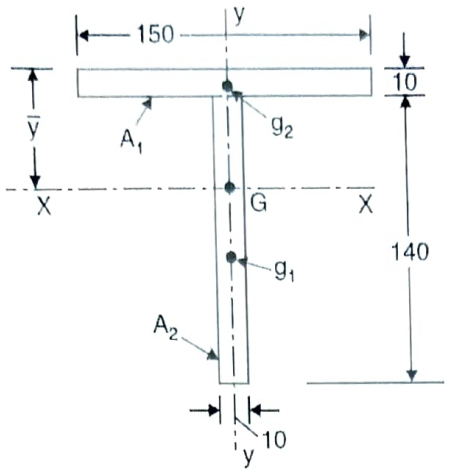

Figure 7

Q3 Using the method of joints, determine the force in each member of the truss as shown in Fig. 8. And State whether each member is in tension or compression (10)

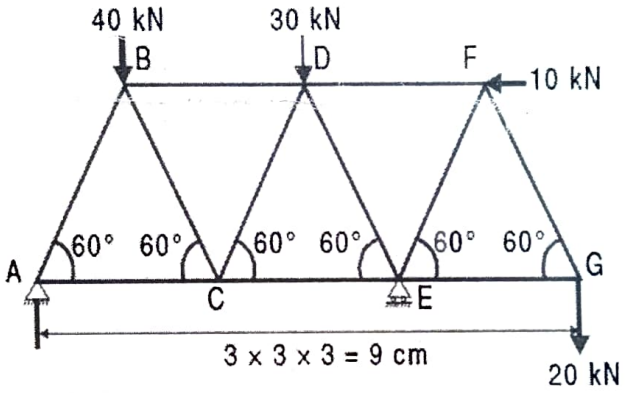

Figure 8

Q4 Two weights 800 N and 200 N are connected by a thread and they move along a rough horizontal plane under the action of force of 400 N applied to the 800 N weight as shown in Fig. 9. The coefficient of friction between the sliding surface of the weights and the plane is 0.3. Using D' Alembert's principle determines the acceleration of the weight and the tension in the thread. (10)

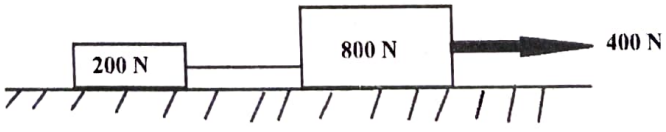

Figure 9

Q5 (a) The ladder shown in following Fig. 10. is 6 m long and is supported by a horizontal floor and vertical wall. The coefficient of friction between the floor and the ladder is (5)

0.4 and between wall and ladder is 0.25. The weight of ladder is 200N and may be considered as concentrated at G. The ladder also supports a vertical load of 900N at C which is at a distance of 1m from B. Determine the least value of α at which the ladder may be placed without slipping. Determine the reaction at that stage.

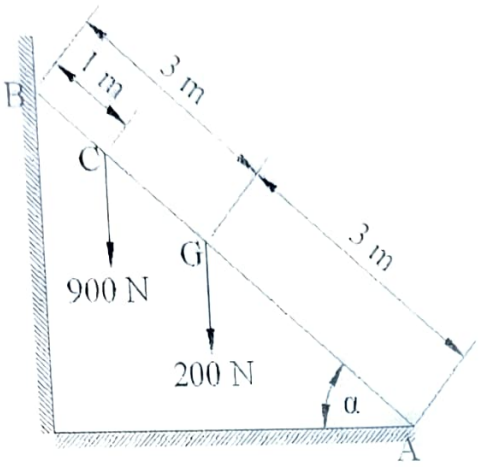

Figure 10

(b) Determine the reactions of the beams loaded as shown in following Fig. 11. (5)

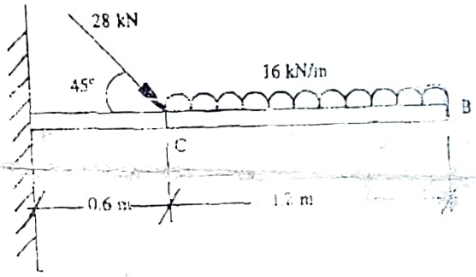

Figure 11

Q6 (a) Derive the expression for the relationship between tight side and slack side forces in a belt friction $\frac{T_1}{T_2} = e^{\mu\theta}$ (5)

(b) Determine the centroid of an arc of radius R from first principle.as shown in Fig. 12 (5)

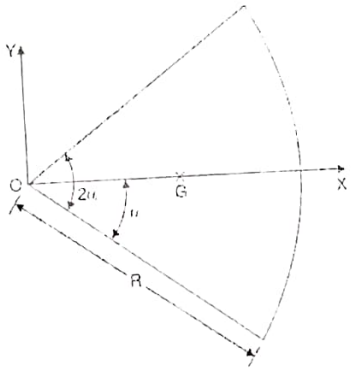

Figure 12

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If the body is in eqm each force is ∝ to the sine of the angle b/w the other 2 forces.