H86

Department of Applied Mechanics

S V NATIONAL INSTITUTE OF TECHNOLOGY, SURAT

END SEMESTER EXAM – May 2019

B.Tech. – I (Div – F – G – H – I - J) –2nd Semester

ENGINEERING MECHANICS

Marks: 100	**02/05/2019**	**Time: 9.30 to 12.30 am**	**Roll No.** H-86

Note: 1. Take g = 9.81 m/s^2

2. All parts of a Question must be together.

Q-1 Attempt any two **10**

Q-1A Determine the magnitude of forces F_1 and F_2 shown in Figure-1, when the resultant of the given force system is found to be 800 N along positive x-axis. **05**

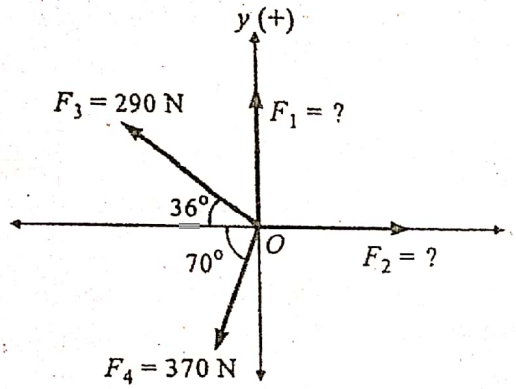

Figure-1

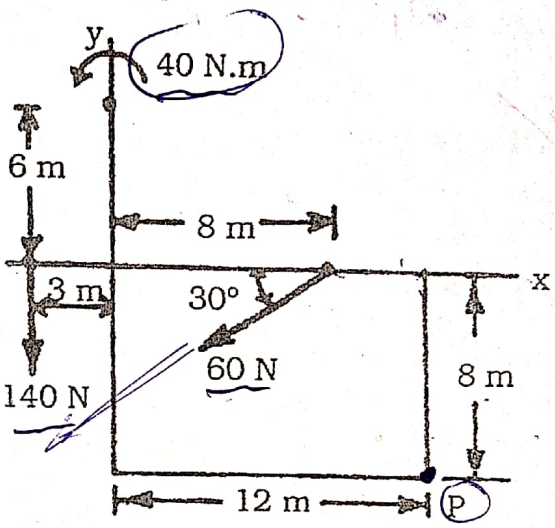

Figure-2

Q-1B Replace the force and couple moment system **Figure-2** by an equivalent force and couple moment acting at Point P. **05**

Q-1C A 100-kg block moves between vertical guides as shown in Fig-3. The block is given vibration by initially pulling it down by 50 mm from its equilibrium position and released. The springs may be kept in parallel. **05**

Determine for the arrangement

(i) the period of vibration.

(ii) the maximum velocity of the block. And

(iii) the maximum acceleration of the block.

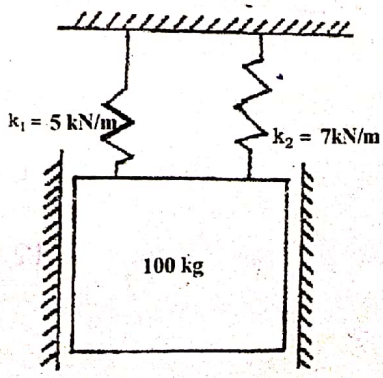

Figure-3

Q-2A Two spheres A and B of weight 1000N and 750 N, respectively are kept as shown in the Figure-4. Determine the reactions at all contact points 1, 2, 3 and 4. Radius of A = 400 mm and Radius of B = 300 mm. **05**

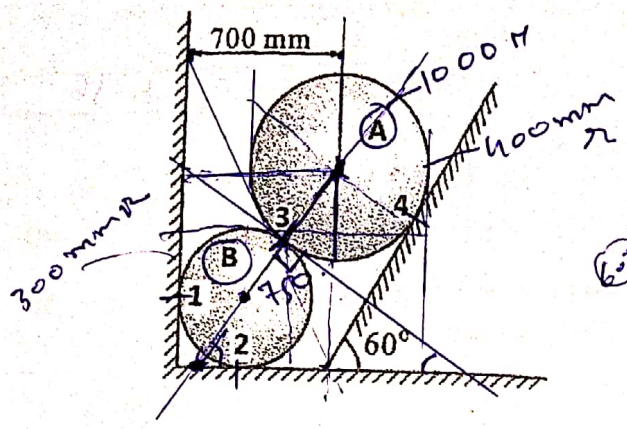

Figure-4

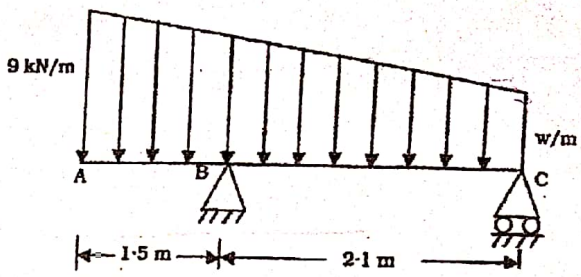

Figure-5

Q-2B Determine the intensity of the distributed load 'w' at the end 'C' of the beam ABC (shown in figure-5) for which reaction at 'C" is zero, also find out reaction at B. **05**

Q-3 Determine the tension in cables BC & BD and the reactions at the ball and socket joint A for the pole in equilibrium shown in figure-6.Force acting at B is F= -10 j kN. **10**

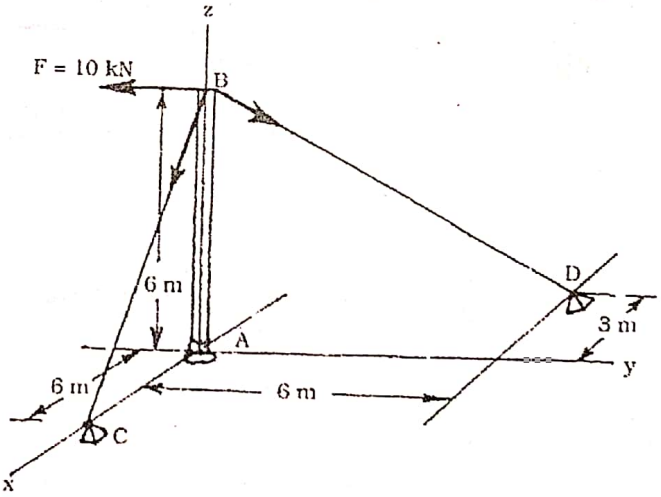

Figure-6

Q-4A Locate the centroid of bent wire shown in Figure-7 (L_1 =67 mm, θ_1 =60^0,R =44mm and θ_3 =45^0) **05**

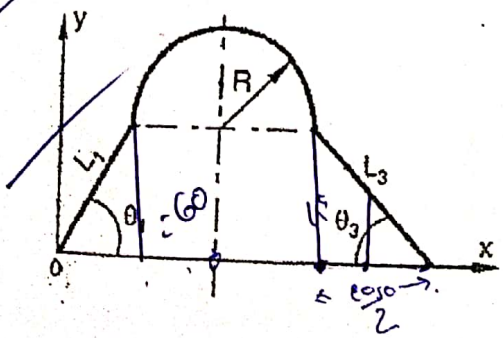

Figure-7

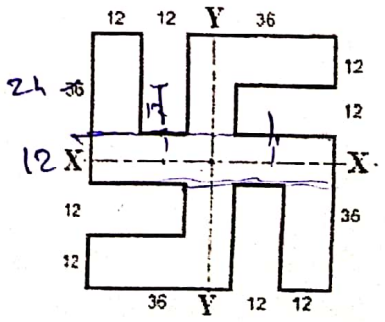

Figure-8

Q-4B Compute moment of inertia about both the centroidal axis XX and YY of a 'Holy Mark of Swastika' shown in Figure-8 (All dimensions are in mm) **05**

Q-5 Determine the force P required to move the block A of weight 4kN up the inclined plane. Coefficient of friction between block A and wall is 0.3 and between all other surfaces is 0.25. The weight of wedge is 50 N and wedge angle is 15°. (Figure-9) **10**

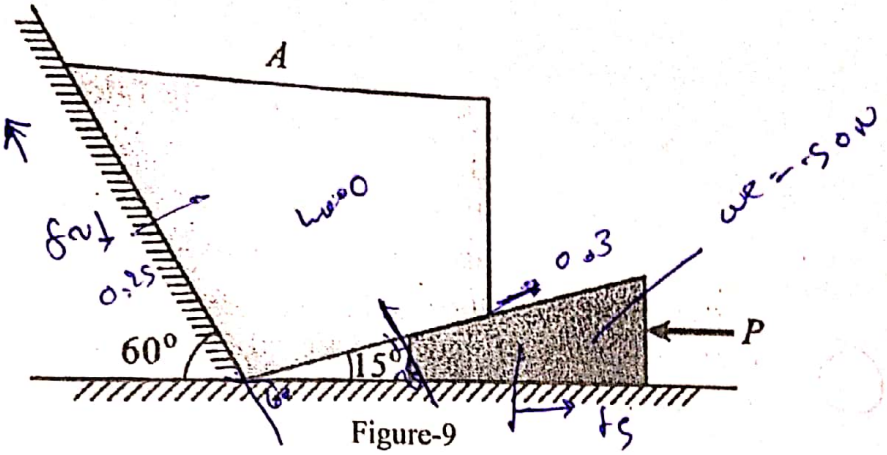

Figure-9

Q-6 Determine distance d_C for which portion DE of the cable is horizontal, also determine the corresponding reactions at A and E. Also determine the total length of cable. [Refer Figure-10] **10**

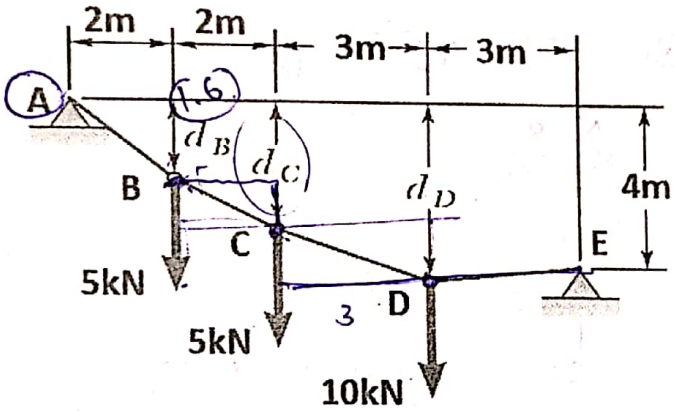

Figure-10

Q-7A Identify Zero force members for the truss shown in Figure-11 **03**

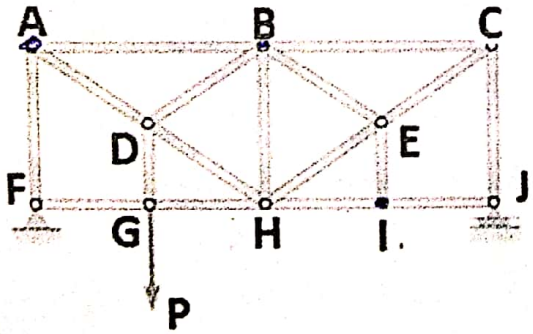

Figure-11

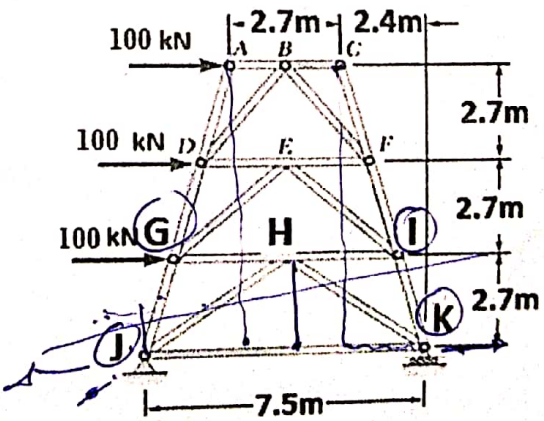

Figure-12

Q-7B Determine the force in members GJ and IK of the truss shown in Figure-12 **07**

Q-8A A particle of mass 1 kg is acted upon by a force F which varies as shown in Figure13. If initial velocity of the particle is 10 m/s. **05**

Determine (i) What is the maximum velocity attained by the particle and

(ii) the time when particle will be at point of reversal

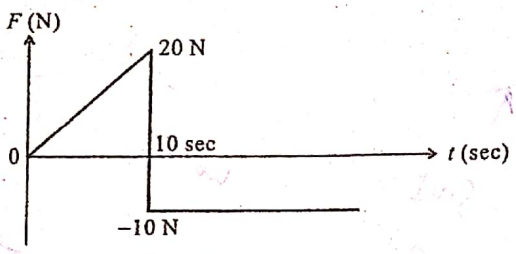

Figure-13

Q-8B A glass marble, whose weight is 0.2 N, falls from a height of 10 m and rebounds to a height of 8 m. Find the impulse and the average force between the marble and the floor, if the time during which they are in contact is 1/10 of a second. **05**

Q-9 Masses A = 5 kg, B =10 kg and C = 20 kg are connected as shown in Figure-14, by inextensible cord passing over massless and frictionless pulleys. The coefficients of friction for mass A and B and ground is 0.2. If the systems is released from rest, find the acceleration a_A, a_B and a_C and tension T in the cord. **10**

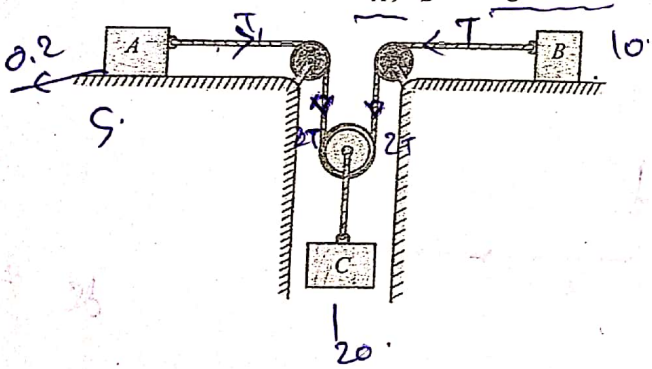

Figure-14

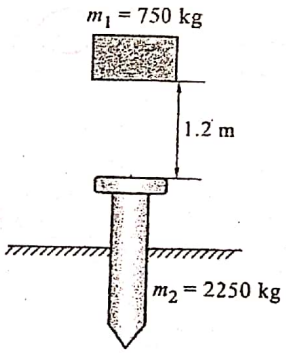

Figure-15

Q-10 A 750 kg hammer of a "Drop hammer pile driver" falls from a height of 1.2m onto the top of a pile as shown in Figure-15. The pile is driven 100 mm into the ground. Assume perfectly plastic impact, determine the average resistance of the ground to penetration. Assume mass of pile as 2250 kg. **10**

********** All the Best **********

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MID SEMESTER EXAM – MARCH 2019

B.Tech. – I (Div – F – G – H – I - J) –2nd Semester

ENGINEERING MECHANICS

Marks: 30	08/03/2019	Time: 9 to 10.30 am	Roll No.

Note: 1. Take g = 9.81 m/s^2

2. All parts of a Question must be together

Q-1 **Answer any two**

Q1A A car is pulled by means of two ropes as shown in Figure-1. The tension in one rope is P=2.6 kN. If the resultant of two forces applied at O is directed along the x- axis of the car. Find the tension in the other rope and magnitude of the resultant. 05

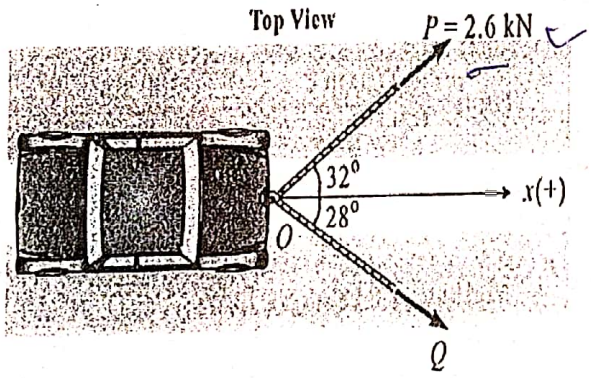

Figure-1

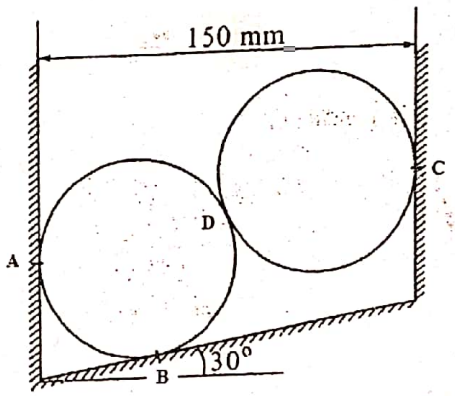

Figure-2

Q1B Two cylinders each of diameter 100 mm and each weighing 200N are placed as shown in Figure-2. Assuming that all the contact surfaces are smooth, find the reactions at A, B, C and D 05

Q1C Replace the given force and couple by a single force and couple system at O 05

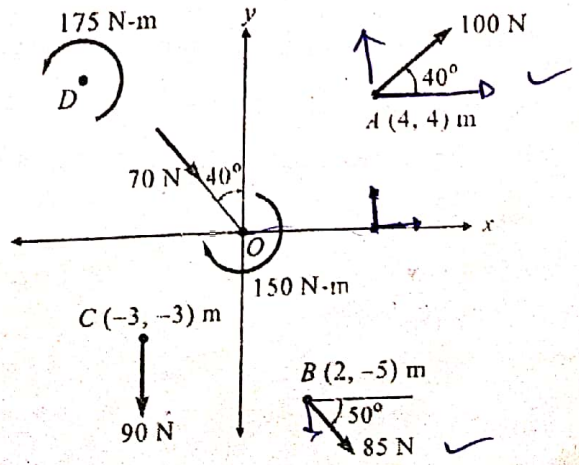

Figure-3

Q-2 A 50 N circular plate of 18 cm radius is supported (as shown in Figure-4) by three wires, each of 60 cm length. Determine the tension in each wire knowing that $\alpha = 30°$. 10

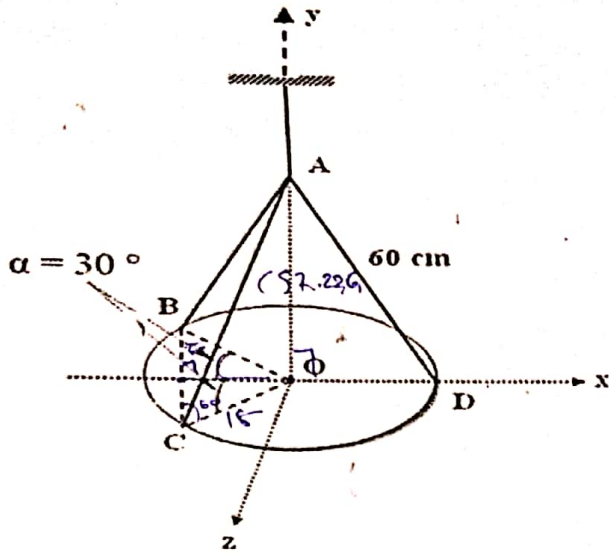

Figure-4

Q-3 Locate the centroid of the shaded portion shown in Figure-5 with respect to given x and y axis 06

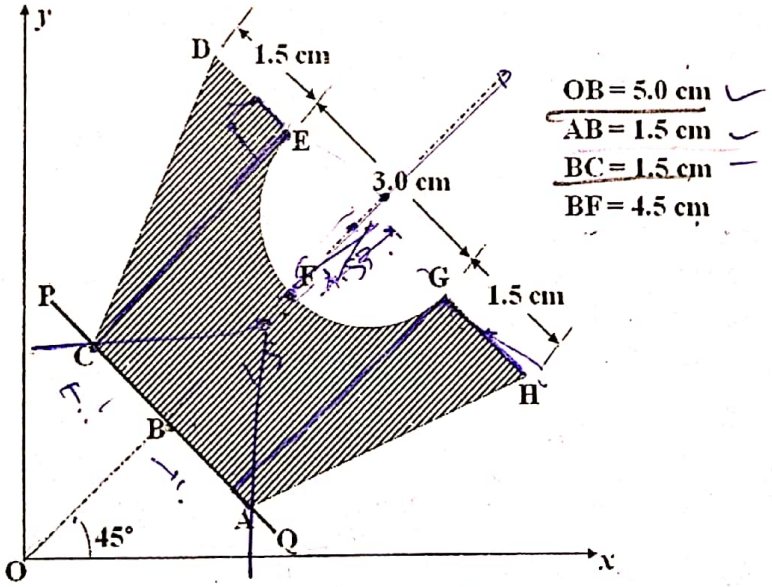

Figure-5

Q-4 Determine the Moment of inertia of shaded portion shown in figure-5 about PQ 04

********** All the Best **********