17CIV13/23

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First/Second Semester B.E. Degree Examination, Aug./Sept. 2020
Element of Civil Engineering and Engineering Mechanics

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1   a.   Explain the Impact of Infrastructural facilities on the Socio-economic development of a country. **(06 Marks)**

     b.   Define moment, couple and explain the characteristics of couple. **(07 Marks)**

     c.   Prepare the horizontal force 30N acting on the lever arm as shown in the Fig Q1(c) by an equivalent system. Consisting of a force and a couple at 'O'.

Fig Q1(c)   **(07 Marks)**

OR

2   a.   Explain the classification of Road system. **(06 Marks)**

     b.   With a neat figure, explain the 3 principles of engineering mechanics. **(07 Marks)**

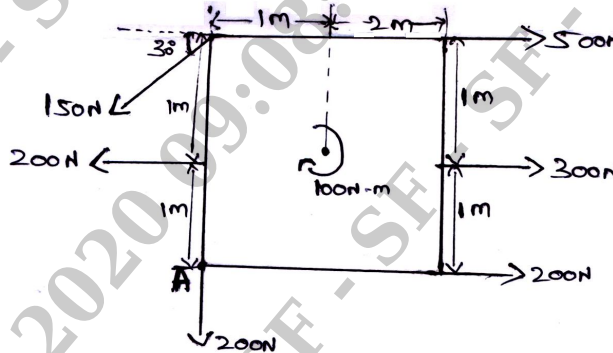   c.   Determine the moment at the point 'A' for the force system shown in the Fig Q2(c).

Fig Q2(c)   **(07 Marks)**

Module-2

3   a.   Define co-efficient of friction and angle of friction, show that angle of friction is equal to coefficient of friction. **(06 Marks)**

     b.   Determine the resultant of force system acing on a structure as shown in the Fig Q3(b) at A.
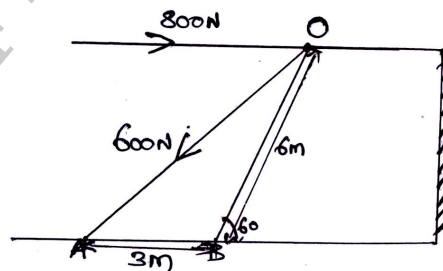

Fig Q3(b)   **(08 Marks)**

c. The collar of weight 264.4N slides on a frictionless vertical rod and its connected to 294N counter weight. Determine the value of height 'H' for which system is in equilibrium as shown in Fig Q3(c).
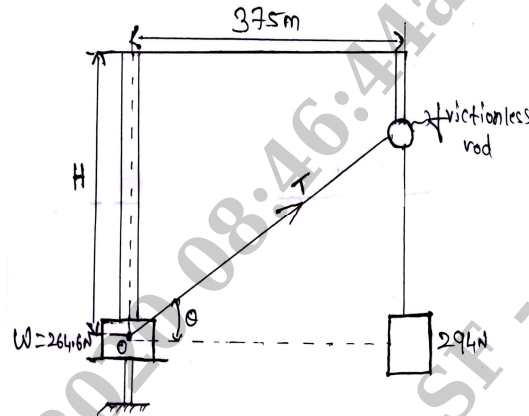
Fig Q3(c) **(06 Marks)**

OR

4 a. Define the following : i) Composition of forces ii) Equilibrium iii) Angle of Repose.
(06 Marks)

b. A block of weight 5kN rest on a horizontal rough surface and the co-efficient of friction between them is 0.4. Show that the magnitude of force required to pull is less than magnitude of force required to push, if the angle made by both force pull and push is 30° with respect to horizontal. **(08 Marks)**

c. A block is pulled by 2 ropes as shown in Fig 4(c) if the resultant of the 2 forces is 5kN and directed along the axis of the block. Determine the tension in the each of the rope.
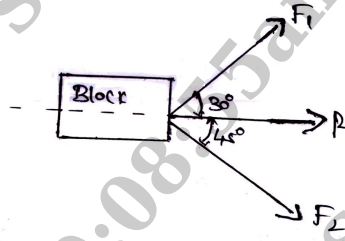
Fig Q4(c) **(06 Marks)**

Module-3

5 a. Determine the resultant and moment at the point 'A' for the system of forces acting on the square block of size 2m each as shown in the Fig Q5(a)
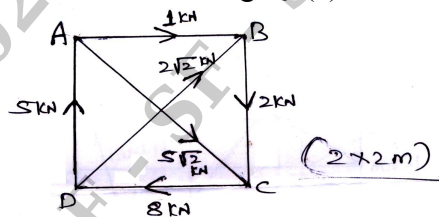
Fig Q5(a) **(08 Marks)**

b. Determine the support reaction of the overhanging Beam shown in the Fig Q5(b).
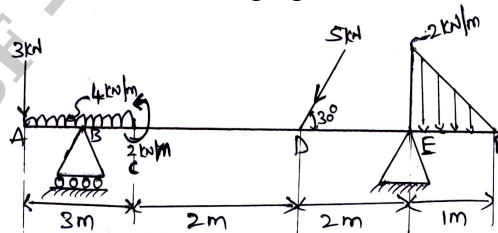
Fig Q5(b) **(08 Marks)**

c. With a neat figure, explain the different types of supports. **(04 Marks)**

OR

6 a. Assuming pulley to be smooth, calculate support reactions for Beam AC as shown in Fig Q6(a).
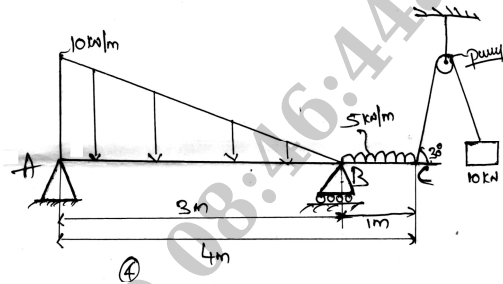
Fig Q6(a) **(10 Marks)**

b. Determine the magnitude, direction and point of application of resultant force for the system of forces shown in Fig Q6(b). With respect to point 'O'.
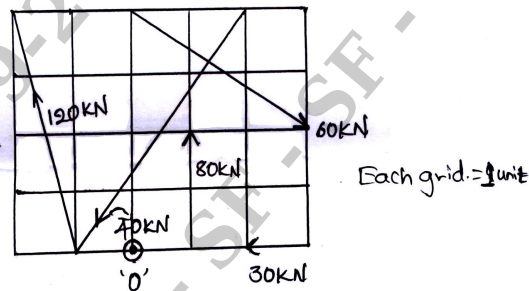

Fig Q6(b) **(10 Marks)**

Module-4

7 a. Differentiate between centroid and moment of Interia. **(04 Marks)**

b. State and prove parallel axis theorem. **(06 Marks)**

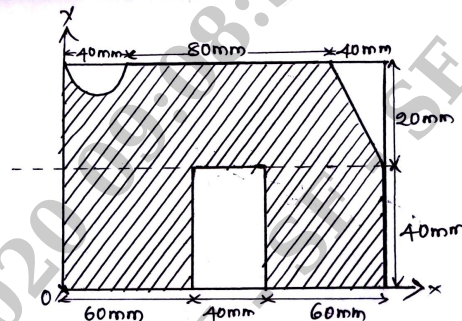c. Locate the Centroid of shaded area shown in the Fig Q7(c).

Fig Q7(c) **(10 Marks)**

OR

8 a. Derive an Expression for centroid of quarter circle of radius' R'. **(08 Marks)**

b. Determine the moment of inertia about x-x axis shown in Fig Q8(b) all dimension are in mm.
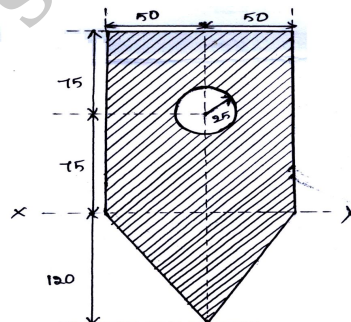

Fig Q8(b) **(12 Marks)**

Module-5

9 a. With a neat figure and equation define the following :
  i) Path of projectile   ii) Horizontal Range   iii) Time of flight
  iv) Super elevation   v) Average velocity. **(10 Marks)**

b. A Pulley 300mm in diameter is wounded round by a rope with one of the ends of rope fixed to pulley and the other end is fixed to a weight freely hanging as shown in Fig Q9(b). The weight moves down by 8m after starting from rest in 4 seconds. Find the angular velocity of the pulley. Find also the total distance to moved by weight to make the pulley to rotates 400 rpm.
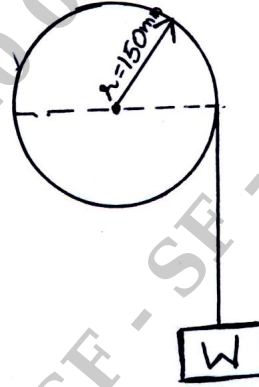
Fig Q9(b) **(10 Marks)**

OR

10 a. An automobile weighing 30kN moves on a road with longitudinal, section shown in Fig Q10(a), if it is moves with a velocity of 72kmph, what is the vertical reaction. Expressed at the points P, Q, and R.
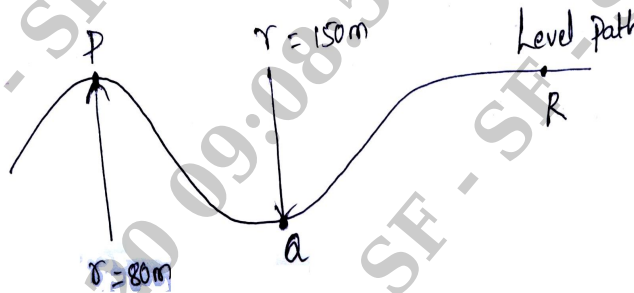
Fig Q10(a) **(10 Marks)**

b. A motorist is travelling on a straight road at a speed of 10m/sec. When he observes that the traffic. Signal 600m ahead of him turn red. The traffic light is timed to stay red for 15sec, if the motorist wishes to pass the light without stopping just as it turns green again than find :
  i) uniform acceleration of the motorist
  ii) speed of the car is it passes the traffic light. **(10 Marks)**

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