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15CIV13/23

First/Second Semester B.E. Degree Examination, Dec.2018/Jan.2019 Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs.

Max. Marks: 80

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

Module-1

1.
 - a. Explain role of civil engineer in the infrastructural development. (06 Marks)
 - b. Define force and its characteristics. (03 Marks)
 - c. Determine the angle θ for the force $F = 200\text{N}$ shown in Fig Q1(c) so that it produces
 - i) maximum moment about A
 - ii) the minimum moment about A.
 Determine the maximum and minimum moment. (07 Marks)

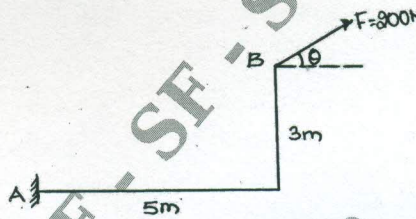


Fig Q1(c)

OR

2.
 - a. Explain different types of roads. (04 Marks)
 - b. Explain with neat sketch law of physical independence, Law of super position and law of transmissibility of force. (06 Marks)
 - c. The moment of a certain force F is 180 kN-m clockwise about O and 90 kN-m counter clockwise about B . If its moment about A is zero, determine the force F for Fig Q2(c).

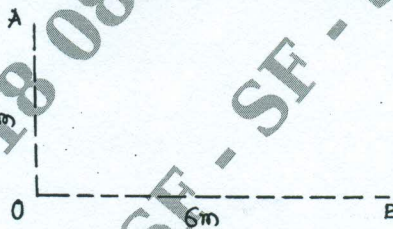


Fig Q2(c)

(06 Marks)

Module-2

3.
 - a. State and prove parallelogram law of forces. (05 Marks)
 - b. Forces are transmitted by two members as shown in Fig Q3(b). If the resultant of these forces is 1400N directed upward vertically, find angle α and β .

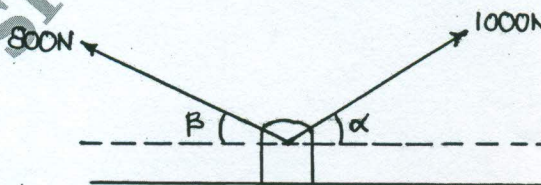


Fig Q3(b)

(06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- c. Compute the resultant of the force system as in Fig Q3(c).

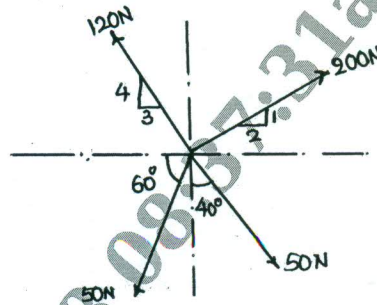


Fig Q3(c)

(05 Marks)

OR

- 4 a. State prove Lami's theorem. (05 Marks)
 b. Determine the tension in the string and the reaction at contact surface for the cylinder of weight 1000N placed as shown in Fig 4(b). (05 Marks)

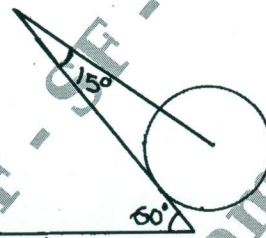


Fig Q4 (b)

- c. What should be the value of θ in Fig Q4(c) which will make the motion of 900N block down the plane to impend? The coefficient of friction for all contact surfaces is 0.33.



Fig Q4(c)

(06 Marks)

Module-3

- 5 a. State and prove Varignon's principle of moments. (06 Marks)
 b. Determine the resultant of the force system acting on the plate as shown in Fig Q5(b) with respect to AB and AD. (10 Marks)

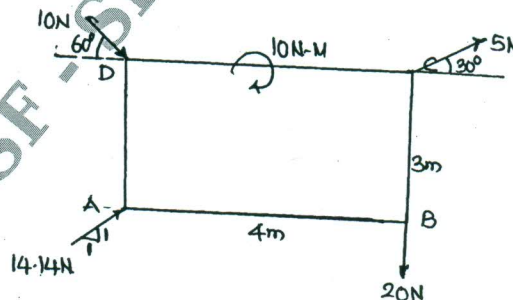


Fig Q5(b)
 2 of 4



OR

- 6 a. Explain with neat sketch different types of beams and loadings. (06 Marks)
- b. Determine the reactions at A and B for the loaded beam shown in Fig Q6(b).

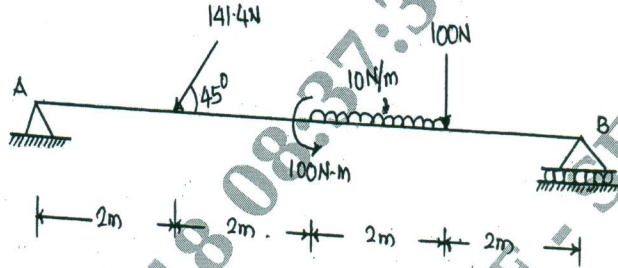


Fig Q6(b)

(10 Marks)

Module-4

- 7 a. State and prove parallel axes theorem. (06 Marks)
- b. Determine the position of the centroid for the shaded area with respect to the axes shown in Fig Q7(b).

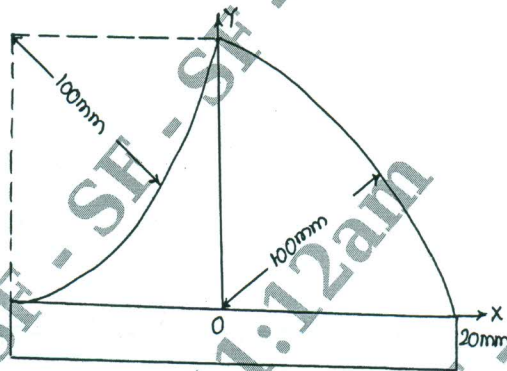


Fig Q7(b)

(10 Marks)

OR

- 8 a. From first principle derive the relation for centroid of a triangle with base b and height h. (06 Marks)
- b. Determine the moment of inertia of a prestressed concrete beam section shown in Fig Q8(b) about horizontal and vertical axis passing through centroid.

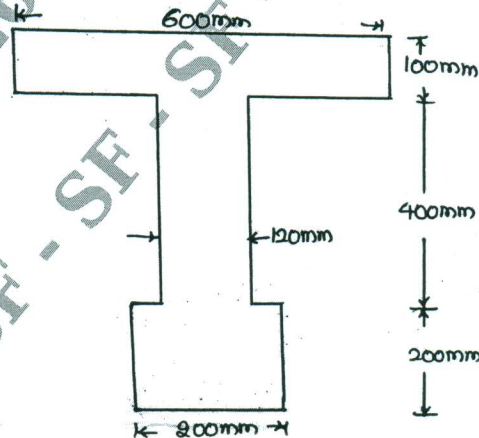


Fig Q8(b)

(10 Marks)

Module-5

- 9 a. Explain Displacement, Distance travelled, velocity and acceleration in rectilinear kinematic. (08 Marks)
- b. A sprinter in a 100m race accelerates uniformly for the first 40m and then runs with constant velocity. If the sprinter's time for the first 40m is 5.2 seconds, determine his time for race. (04 Marks)
- c. A ball is projected vertically upwards with a velocity of 20m/sec. Two seconds later, a second ball is projected vertically upwards with a velocity of 16m/sec. Find the height above the surface at which the two ball meet. (04 Marks)

OR

- 10 a. A cricket ball thrown from a height of 1.8m above ground level at an angle of 30° with the horizontal with a velocity of 12m/sec is caught by a fielder at a height of 0.6m above the ground as shown in Fig Q10(a). Determine the distance between the two players.

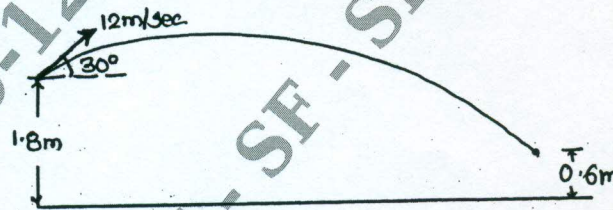


Fig Q10(a)

- b. The motion of a particle starting from rest is defined by $a = 10t - t^2$ where a is in m/sec^2 and t is in seconds. Find the displacement before it starts in reverse direction of motion and velocity when acceleration changes its direction. (08 Marks)
