CBCS SCHEME

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17CIV13/23

First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
Elements of Civil Engineering and 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 briefly the scope of the following civil engineering fields:
i) Surveying
ii) Structural Engineering. **(06 Marks)**

b. Explain briefly:
i) Equilibrium and Equilibrant
ii) Rigid body and elastic body
iii) Scalars and vectors. **(06 Marks)**

c. Two forces act at an angle of 120°. The bigger force is of 40kN and the resultant is perpendicular to the smaller force. Find the small force. **(08 Marks)**

OR

2 a. What is the role played by a civil engineering in the infrastructure development of a country? **(06 Marks)**

b. Draw a neat sketch of components of pavement. Explain it briefly. **(06 Marks)**

c. 4 forces acting at point 'O', Determine the direction and magnitude of the resultant force with respect to the given axes of reference. **(08 Marks)**

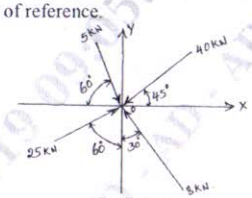

Fig.Q.2(c)

Module-2

3 a. Define: i) Angle of friction ii) Limiting friction iii) Coefficient of friction. **(06 Marks)**

b. A body of weight 100N is suspended by which two strings 5m and 4m length attached at same horizontal line 6m apart. Find tension in the strings. **(08 Marks)**

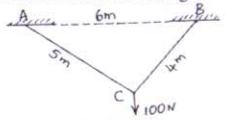

Fig.Q.3(b)

c. State and prove Lami's Theorem. **(06 Marks)**

OR

4 a. State the laws of friction. **(06 Marks)**

b. Explain the resolution of force. **(04 Marks)**

c. A string ABCD attached to two fixed points A and D has two equal weights of 100N attached to it at B and C. The weights rest with the portions AB and CD inclined at an angle of 30° and 60° respectively to the vertical as shown in Fig.Q4(c). Find the tensions in the portions AB, BC and CD of the string and also find the inclination of the portion BC with the vertical is 'θ'. **(10 Marks)**

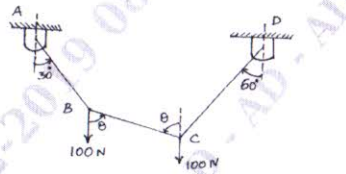

Fig.Q.4(c)

Module-3

5 a. Explain the different types of supports and types of loads with neat sketches. **(08 Marks)**

b. The system of forces acting on a body as shown in Fig.Q.5(b) below. Find forces R_1, R_2 and H. Show that the body is in equilibrium. **(12 Marks)**

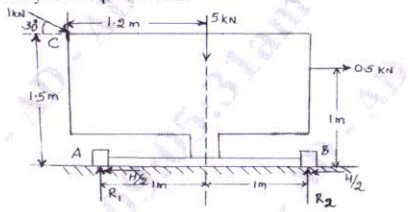

Fig.Q.5(b)

OR

6 a. State and prove the Varignon's theorem and its application. **(08 Marks)**

b. Find the reactions at all supports of the composite beam loaded as shown in Fig.Q.6(b) **(12 Marks)**

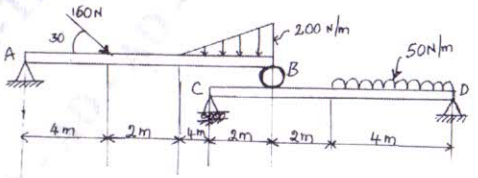

Fig.Q.6(b)

Module-4

7 a. Define:
   i) Moment of Inertia
   ii) Radius of gyration
   iii) Polar moment of Inertia. **(06 Marks)**

   b. Explain perpendicular Axis theorem. **(04 Marks)**

   c. Determine the position of centroid of the shaded area of the Lamina shown in Fig.Q.7(c) with respect to '0'. **(10 Marks)**

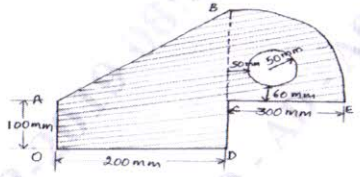

Fig.Q.7(c)

OR

8 a. Derive the expression for coordinates of centroid of a trapezium whose parallel sides are 'a' and 'b' and altitude h. **(10 Marks)**

   b. Determine the moment of inertia of a section shown in Fig.Q.8(b) about the horizontal axis passing through the centroid. All dimension are in mm. Also find the radius of gyration. **(10 Marks)**

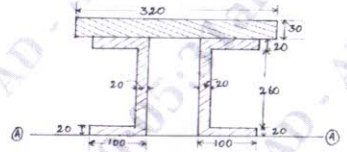

Fig.Q.8(b)

Module-5

9 a. A tower is 90m in height. A particle is droped from the top of the tower and at the same time another particle is projected upward from the foot of the tower. Both the particle meet at a height of 30m. Find the velocity with which the second particle is projected upward. **(10 Marks)**

   b. A cricket ball thrown by a player from a height of 2m above the ground at an angle of 30° to the horizontal with a velocity 20m/sec is caught by another fieldsman at a height of 1m from the ground. Find the distance between the two players. **(10 Marks)**

OR

10 a. Calculate the super elevation required for a circular track of radius 250m. for a vehicle travelling at 50kmph. Also calculate the side thrust on such a super elevated road if the weight of the vehicle is 10kN and the speed is raised to 80kmph. **(10 Marks)**

   b. Define projectiles. Explain the terms used with projectiles. **(06 Marks)**

   c. To prove that the path traced by the projectile by a parabola. **(04 Marks)**

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