CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐

21CIV14/24

First/Second Semester B.E. Degree Examination, July/August 2022

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.

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.

Module-1

1 a. Briefly enumerate the scope of following specialization/branches of civil engineering:
i) Structural Engineering ii) Transportation Engineering. **(10 Marks)**

b. Discuss the role of civil engineer in infrastructure development of a country. **(05 Marks)**

c. Mention the properties and uses of aluminium in construction industry. **(05 Marks)**

OR

2 a. Enlist the qualities of good building stone. **(06 Marks)**

b. What is glass? List its importance and application. **(06 Marks)**

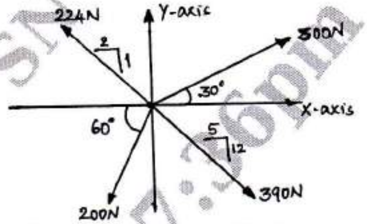
c. Discuss the importance and application of smart materials in construction. **(08 Marks)**

Module-2

3 a. Explain 'Principle of Transmissibility' with a neat sketch. **(04 Marks)**

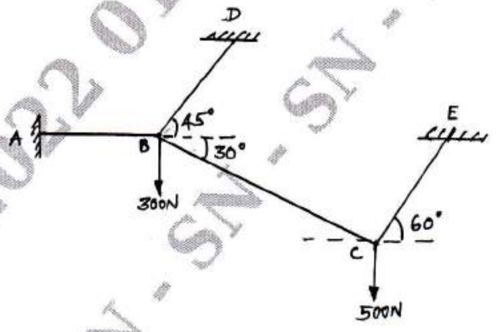
b. Determine the resultant of four concurrent force system acting on a particle as shown in Fig.Q.3(b). **(08 Marks)**

Fig.Q.3(b)



c. The Fig.Q.3(c) shows a system of cables in equilibrium under two vertical loads of 300N and 500N acting at points B and C respectively. Determine the forces developed in all the cables. **(08 Marks)**

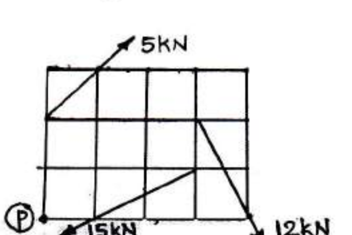
Fig.Q.3(c)



OR

4 a. Determine the magnitude, direction and position of the resultant of the force system shown in Fig.Q.4(a). **(10 Marks)**

Fig.Q.4(a)



Size of the square: 1m×1m

b. A block of mass 20kg placed on an inclined plane as shown in Fig.Q.4(b) is subjected to a force P acting parallel to the plane. The plane is inclined at an angle 30° to the horizontal with coefficient of friction being 0.24. determine the magnitude of P for
   i) Motion of the body impending down the plane.
   ii) Motion of the body impending up the plane. **(10 Marks)**

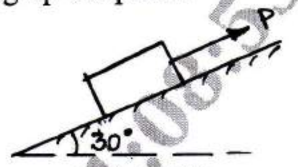


Fig.Q.4(b)

Module-3

5 a. Define the following:
   i) Centroid
   ii) Axis of symmetry. **(02 Marks)**

b. Find the position of centroid of the given area shown in Fig.Q.5(b) with respect to reference axis. All dimensions are in m. **(08 Marks)**

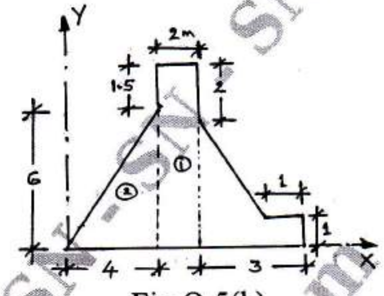


Fig.Q.5(b)

c. Find the polar radious of gyration of the given area shown in Fig.Q.5(c) with respect to its centroidal axis. All dimensions are in mm. **(10 Marks)**

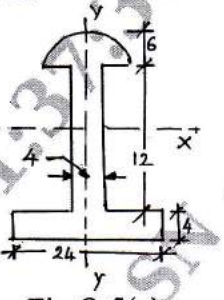


Fig.Q.5(c)

OR

6 a. State and prove parallel axis theorem. **(04 Marks)**

b. Find the moment of inertia of a rectangular area with respect to its centroidal axis from first principles/method of integration. **(06 Marks)**

c. Locate the centroid of the shaded area shown in Fig.Q.6(c) with respect to the X and Y axis. **(10 Marks)**

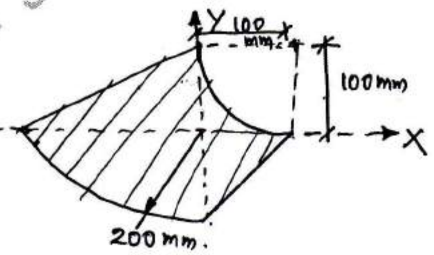


Fig.Q.6(c)

Module-4

7 a. Differentiate between 'determinate and indeterminate' structure with an example for each. **(06 Marks)**

b. Explain the different types of beams and supports. **(06 Marks)**

c. Determine reactions at A and E for the beam shown in Fig.Q.7(c). **(08 Marks)**

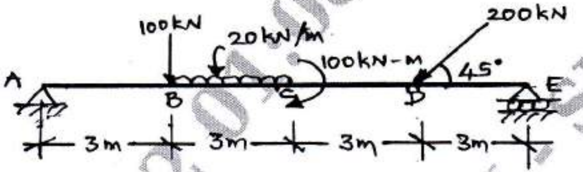


Fig.Q.7(c)

OR

8 a. List the assumptions made in the analysis of truss. **(04 Marks)**

b. Explain different types of loads. **(03 Marks)**

c. Determine the magnitude and nature of forces in the members of the truss shown in Fig.Q.8(c) by method of joints. **(13 Marks)**

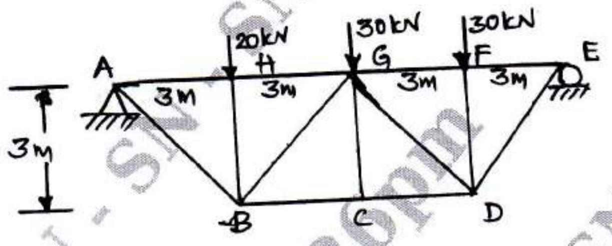


Fig.Q.8(c)

Module-5

9 a. What is Super elevation? Why it is required? **(04 Marks)**

b. Two cars P and Q accelerates from a standing start. The acceleration of P is $1.3 m/s^2$ and that of Q is $1.6 m/s^2$. If Q starts initially 6m behind P, how long it takes to overtake P? **(08 Marks)**

c. A stone 'A' is dropped from a tower of 50m height. At the same height, another stone B is thrown up from the front of the tower with velocity of 25m/s. At what distance from top and after how much time the two stones will cross each other. **(08 Marks)**

OR

10 a. State D' Alembert's principle. Mention its application for the case of plane motion. **(04 Marks)**

b. Two stones A and B are projected from the same point at an inclination of 45° and 30° respectively to the horizontal. Find the ratio of velocities of projection of A and B, if the maximum height reached by them is same. **(08 Marks)**

c. A pilot flying his bomber at a height of 2000m with uniform horizontal velocity of 600kmph wants to strike a target. At what distance from the target he should release the bomb. **(08 Marks)**

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