

# CBCS SCHEME

USN

--	--	--	--	--	--	--	--	--	--

21CIV14/24

First/Second Semester B.E./B.Tech. Degree Examination,  
Dec.2024/Jan.2025

## 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 civil engineering in  
(i) Structural engineering (ii) Transportation engineering. (08 Marks)
- b. Enumerate the qualities of good bricks. (06 Marks)
- c. Name any five types of cements and state their use. (06 Marks)

OR

- 2 a. Briefly explain the role of civil engineers in the development of infrastructure. (08 Marks)
- b. What are the ingredients of ordinary portland cement with their range? (06 Marks)
- c. List the advantages of RCC and PSC. (06 Marks)

### Module-2

- 3 a. State and prove parallelogram law of forces. (06 Marks)
- b. Find the moment of force about A and B for the 30 kN force shown in Fig.Q3(b).

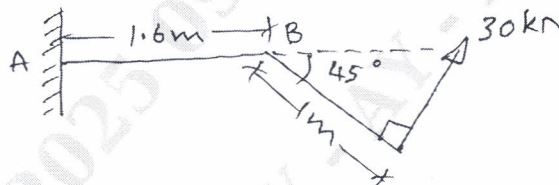


Fig.Q3(b)

(06 Marks)

- c. Two identical rollers each weighing 200 N are placed in a trough as shown in Fig.Q3(c). Assuming all contact surfaces are smooth, find the reactions developed at contact surfaces A, B, C and D.

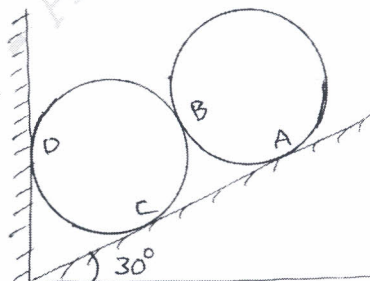


Fig.Q3(c)

(08 Marks)

OR

- 4 a. State and prove Varignon's theorem. (06 Marks)
- b. Determine the magnitude and direction of force 'P' which keeps concurrent system in equilibrium. [Refer Fig.Q4(b)]

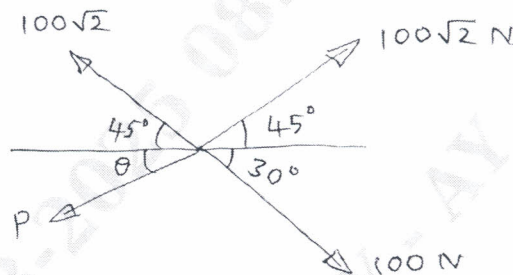


Fig.Q4(b)

(06 Marks)

- c. Determine the angle 'θ' for the system of strings ABCD in equilibrium as shown in Fig.Q4(c).

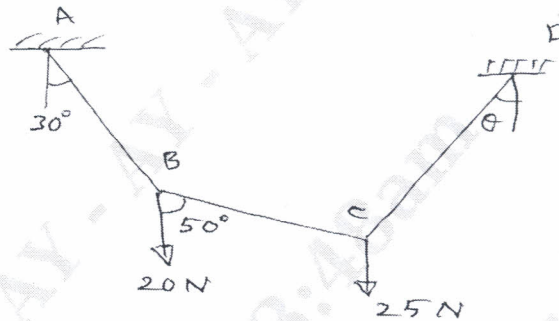


Fig.Q4(c)

(08 Marks)

**Module-3**

- 5 a. State and prove parallel axis theorem. (08 Marks)
- b. Determine the position of centroid for the lamina with a circular cutout shown in Fig.Q5(b).

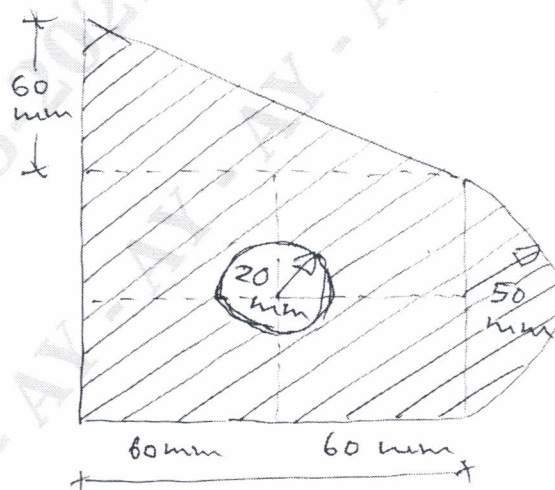


Fig.Q5(b)

(12 Marks)

OR

- 6 a. Determine the centroid of a triangle of base 'B' and height 'H'. (08 Marks)
- b. Find the moment of inertia and radius of gyration of a prestressed concrete beam section shown in Fig.Q6(b) about horizontal and vertical axis passing through the centroid.

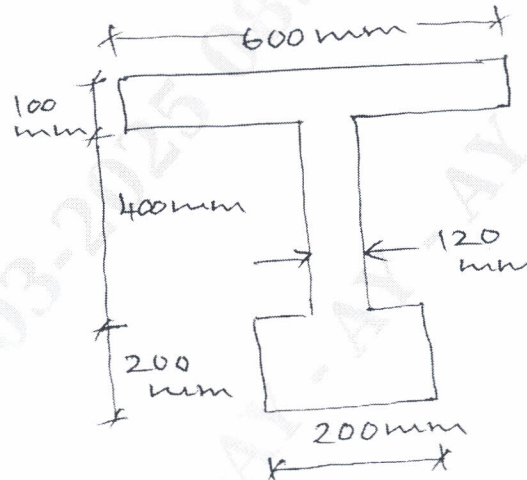


Fig.Q6(b)

(12 Marks)

**Module-4**

- 7 a. Explain with neat sketches the different types of supports. (06 Marks)
- b. Determine the reactions at A and B for the beam shown in Fig.Q7(b).

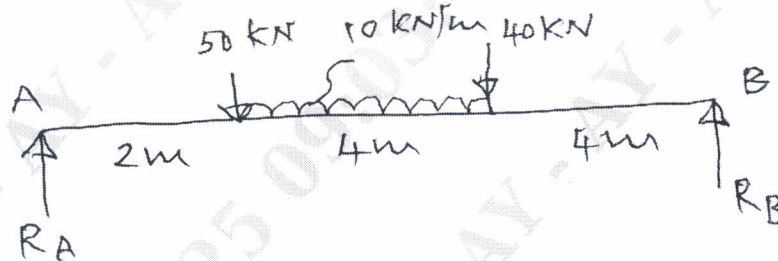


Fig.Q7(b)

(07 Marks)

- c. Determine the forces in the members BC, CF and FE by the method of sections as shown in Fig.Q7(c).

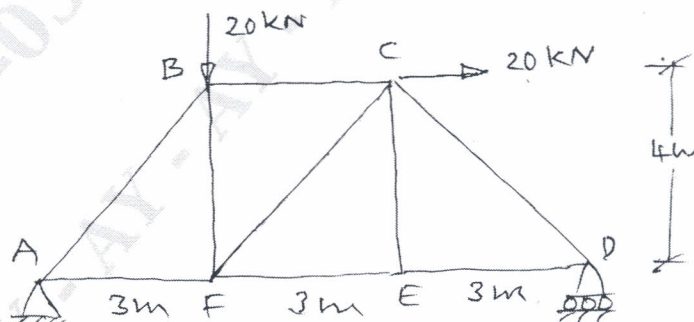


Fig.Q7(c)

(07 Marks)



OR

- 8 a. List the steps followed in the analysis of trusses by method of joints. (06 Marks)
- b. Determine the reactions at A and B for the loaded beam as shown in Fig.Q8(b).

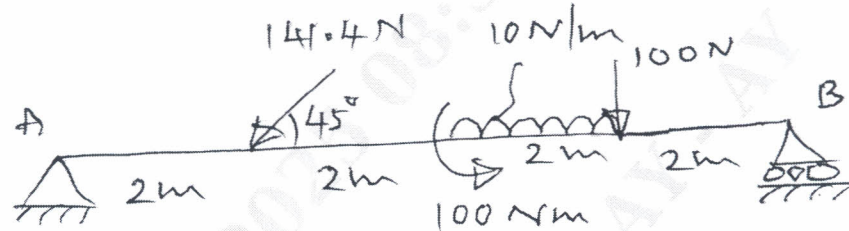


Fig.Q8(b)

(07 Marks)

- c. Find forces in members of truss shown in Fig.Q8(c) using method of joints and tabulate member forces.

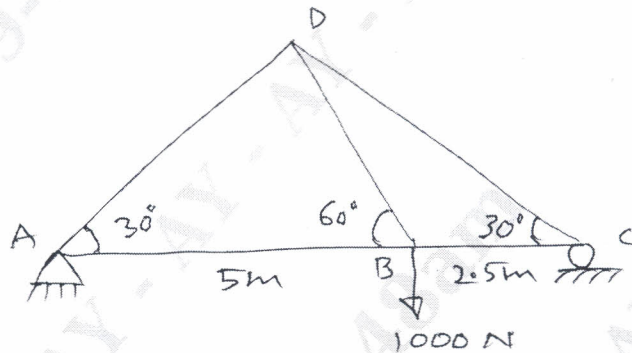


Fig.Q8(c)

(07 Marks)

**Module-5**

- 9 a. What is projectile? Define the following terms briefly with sketch:  
 (i) Angle of projection (ii) Horizontal range (iii) Vertical height (iv) Time of flight (10 Marks)
- b. A police officer observes a car approaching at a constant speed of 60 kmph. He gets on his motor cycle and starts chasing the car just as it passes in front of him. After accelerating for 10 seconds at a constant rate, the officer reaches his top speed of 75 kmph. How long does it takes the officer to overtake the car from the time he started? (10 Marks)

OR

- 10 a. What is super elevation and what is its necessity? (04 Marks)
- b. State and explain D'Alembert's principle. (04 Marks)
- c. A cricket ball thrown by a player from a height of 2 m above the horizontal ground at an angle of  $30^\circ$  to the horizontal and with a velocity of 12 m/s. The ball hits the wicket at a height of 0.6 m above the ground. How far is the player from the wicket? (12 Marks)

\*\*\*\*\*