U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

August 2024 Semester End Main Examinations

Programme: B.E **Semester: I / II**
Branch: Common to all Branches **Duration: 3 hrs.**
Course Code: 21CV1ESECM / 21CV2ESECM **Max Marks: 100**
Course: Elements of Civil Engineering and Engineering Mechanics

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

MODULE - I

1 a) The resultant of two concurrent forces is 400 N. If the forces are inclined at 40^0 and 60^0 with the resultant one on either side, calculate the magnitude of resultant force by using Triangle Law of forces. **04**

b) An adjustable roof truss in a stadium is suspended by cables as shown in Fig Q1 (b) If the tension in the cable CE is 1000 N, when the truss is held in a position such that AB is horizontal, determine the moment of this tension about the point A in two different ways. In the figure AD = 75 cm, BC=30 cm and AB= 8 m **08**

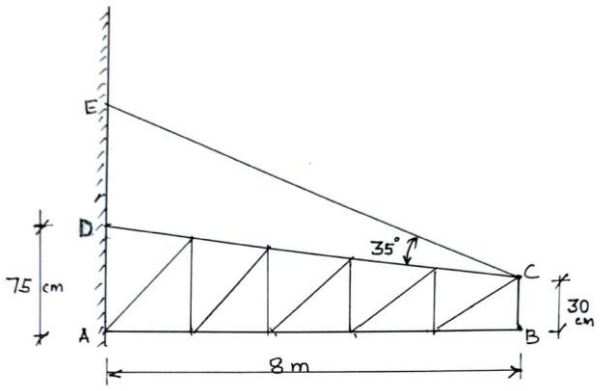


Fig Q1 (b)

c) Two flower pots, shown in Fig.Q1 (c), are supported with steel wires of equal diameter. Pot A weighs 50 N and pot B weighs 20 N. Determine the forces in the different portions of steel wire and the inclination of the segment BC of the wire. **08**

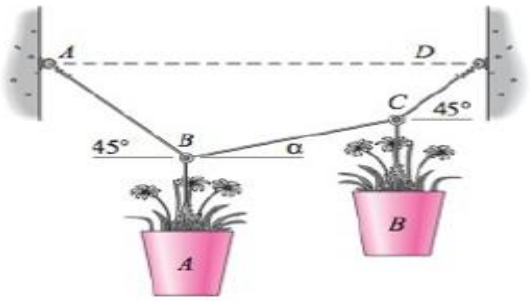


Fig.Q1 (c)

OR

2 a) Three identical rollers each of radius 50 mm and each weighing 250 N are placed inside a rectangular channel of base width 180 mm as shown in Fig Q 2 (a). Assuming all contact surfaces to be smooth, determine the reactions between the rollers B with the surfaces of the channel. **06**

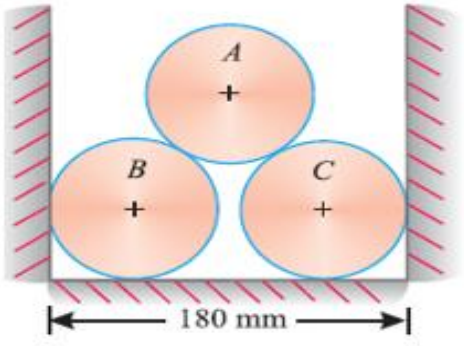
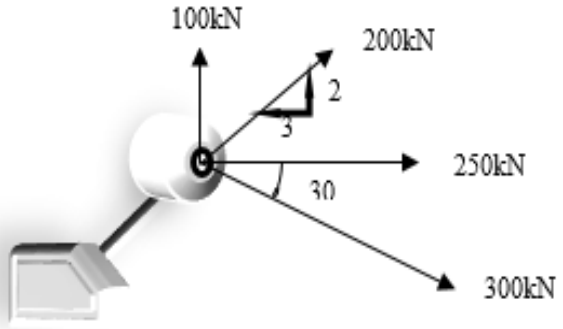


Fig Q 2 (a).

b) Four forces are acting on a bolt as shown in Fig Q 2 (b). Determine the magnitude and direction of the resultant force. **05**



FigQ2 (b)

c) Determine the resultant of the forces acting on a gravity dam section shown in Fig.Q2(c) and locate its intersection with the base AB. The base AB is 6 m wide. The 30 KN force acts normal to the downstream sloping face of the dam. **09**

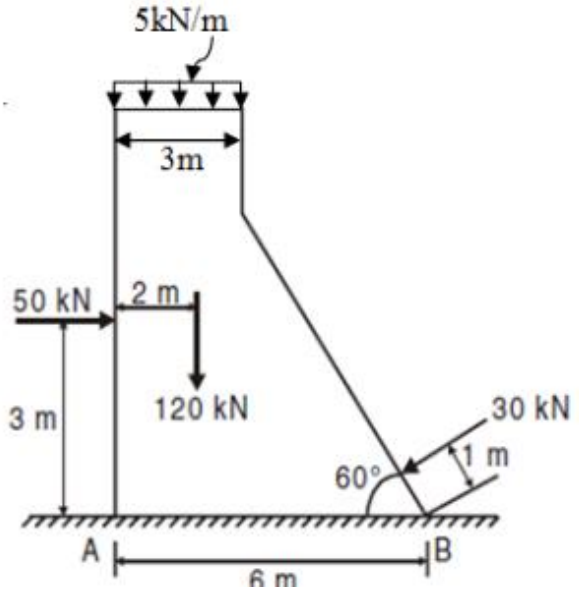


Fig.Q2 (c)

MODULE - II

3 a) Analyze the truss shown in Fig Q3(a) by method of joints and tabulate the results. Also verify the results by method of sections in respect of forces in members' CD and AC. **12**

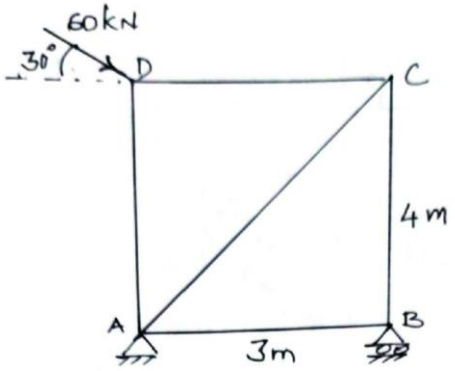


Fig Q 3 (a)

b) Calculate the reactions at the supports for the beam shown in Fig Q 3 (b). **08**

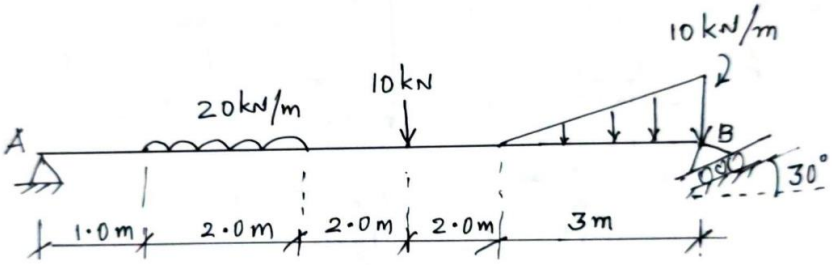


Fig Q3(b)

MODULE - III

4 a) Explain briefly radius of gyration mentioning its significance. **04**

b) Determine the moment of inertia of the shaded area shown in Fig Q 4 (b) about the axis a –b passing through the base as indicated. All dimensions shown are in mm **08**

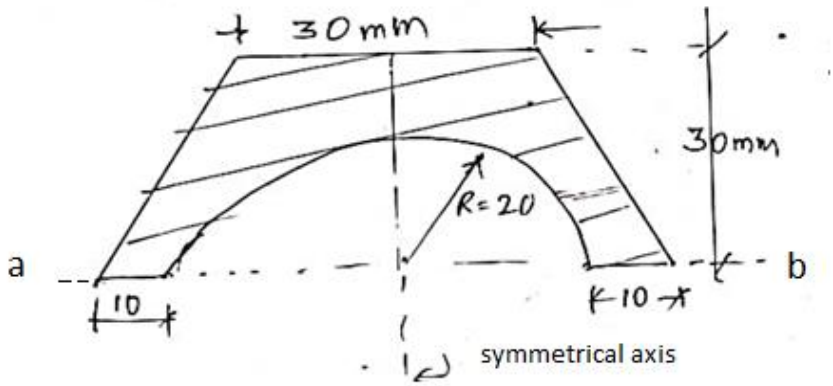


Fig Q 4 (b)

c) Locate the centroid of the plane shaded area shown in Fig Q4 (c) with respect to XX and YY axes indicated. **08**

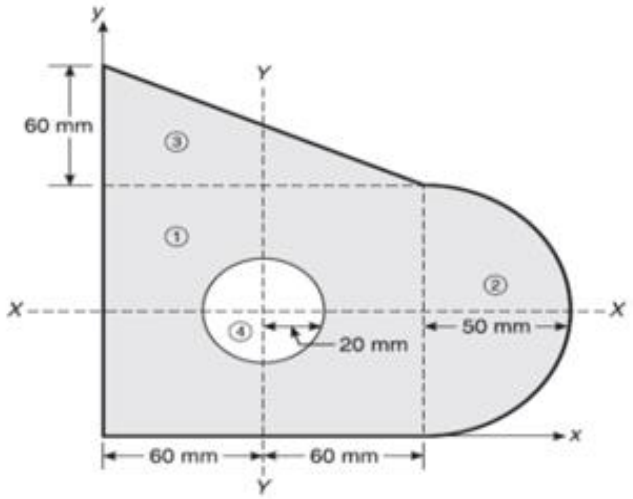


Fig Q4 (c)

OR

5 a) For the triangular plane lamina shown in Fig Q 5 (a), the moment of inertia of about the axis A-B is 16 x 10^{8} mm^{4}. If the base of the triangle is 300 mm, calculate its moment of inertia about the axis C-D located 80 mm below A-B **06**

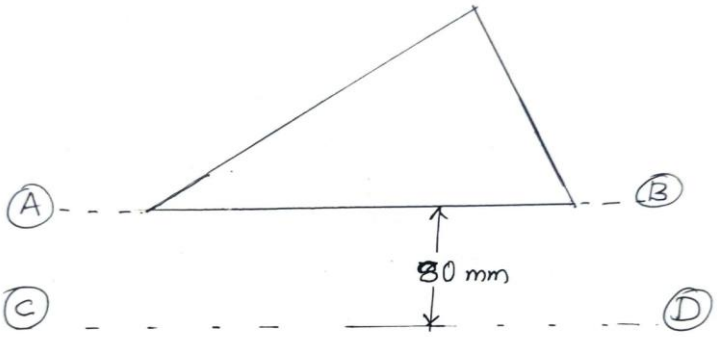


Fig Q 5 (a)

b) For the shaded area shown in Fig Q 5 (b), determine; **14**

(i) The radius of gyration with respect to the vertical axis passing through the centroid.

(ii) Moment of inertia about the 'y' axis as indicated.

All dimensions indicated are in mm

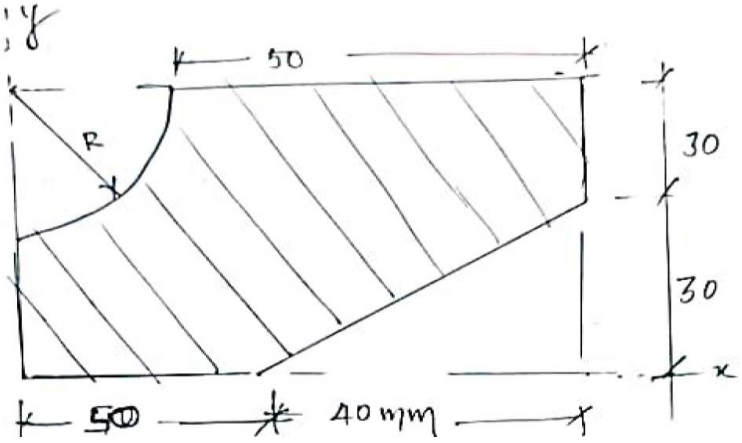


Fig Q 5 (b)

MODULE - IV

6 a) Distinguish between angle of repose and angle of friction. **04**

b) In the Fig Q 6 (b) shown, two 8^0 wedges A and B are used to lift a 500 k g block 'C'. Calculate the least horizontal force 'P' to be applied to the upper wedge 'B' to lift the block. Angle of friction for all contact surfaces is 15^0. Neglect the weight of the wedges. **08**

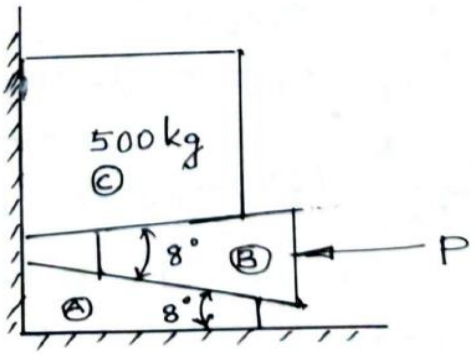


Fig Q 6 (b)

c) A uniform ladder of weight 500 N and 5 m long rests against a rough vertical wall at one end and against a smooth horizontal floor at the other end making 60 ^{0} with the floor. A man weighing 900 N wishes to climb the ladder carrying an additional vertical load of 600 N. If the coefficient of static friction between ladder and the wall is 0.25, determine what minimum horizontal push is to be applied at the foot of the ladder, so that the man safely reaches the top of the ladder. **08**

MODULE - V

7 a) Explain the role of Civil Engineer in the economic prosperity of a Nation. **07**

b) Explain geo technical Engineering. Discuss the need for geo technical investigation in Civil Engineering construction. **07**

c) Write a short note on Transportation Engineering. **06**

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