U.S.N.										

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

Autonomous Institute Affiliated to VTU

December 2023 Supplementary 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) Expalin the concept of idealization of bodies in Mechanics. **04**

b) In the Fig Q 1(b) shown ,force F acts along MA where M is the midpoint of the radius along x-axis. Determine the equivalent force couple system at O if θ = 40°. Assume radius as 'r'. **06**

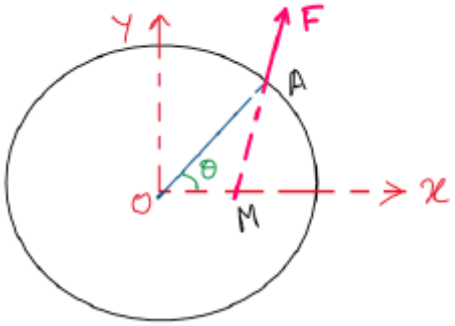

Fig Q 1(b)

c) The resultant of Four forces, of which three are shown in Fig Q 1(c) is 390 N acting down to the right with a slope of 5 vertical to 12 horizontals through the point A. If P = 150 N and F = 130 N, determine the missing force T and its x-intercept. **10**

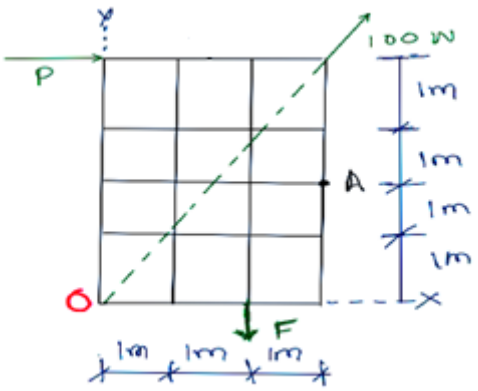

Fig Q 1(c)

OR

2 a) Two homogenous spheres A and B weighing 600 N and 300 N and having diameter 400 mm and 200 mm respectively are placed in trench as shown in fi Fig Q 2(a) Draw the free body diagrams of the spheres A and B and also determine the reaction at contact surfaces. Assume all contact surfaces to be smooth. **10**

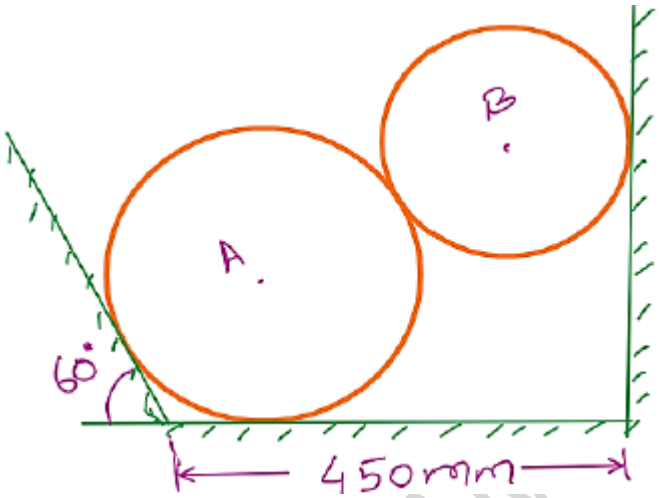

Fig Q 2(a)

b) A 100 kg box is shifted by two persons, one pulling it by exerting a force of 200 N at an angle of 20^0 to the horizontal and another pushing it from behind by exerting a force of 150 N inclined at 10^0 to the horizontal. Determine the resultant force acting on the box. **06**

c) State and prove varignon's theorem. **04**

MODULE - II

3 a) A horizontal beam 6 m long is subjected to loads as shown in Fig Q 3(a). Find the reactions at the supports. **10**

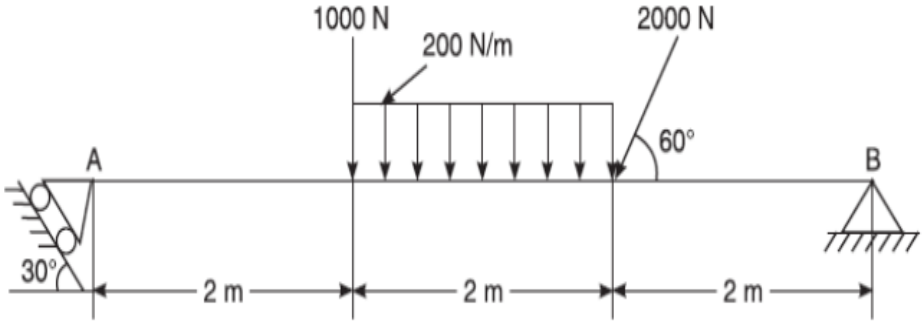

Fig Q 3(a)

b) Analyze the plane pin jointed truss shown in Fig Q 3(b) to determine forces in all members. Tabulate the results. **10**

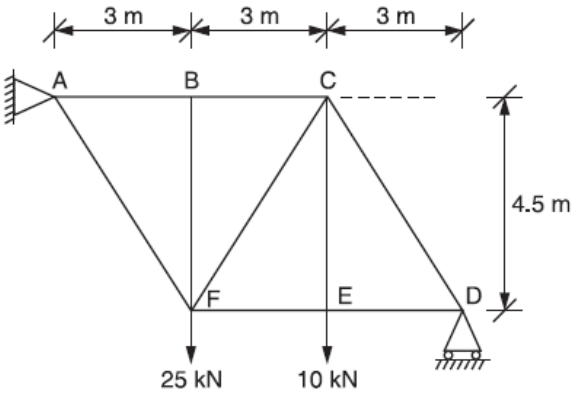

Fig Q 3(b)

MODULE - III

4 a) Obtain from first principles the centroid of a sector of a circle symmetrical about the y-axis. **06**

b) Calculate the polar moment of inertia and the least radius of gyration for the shaded portion shown in Fig Q4 (b). **14**

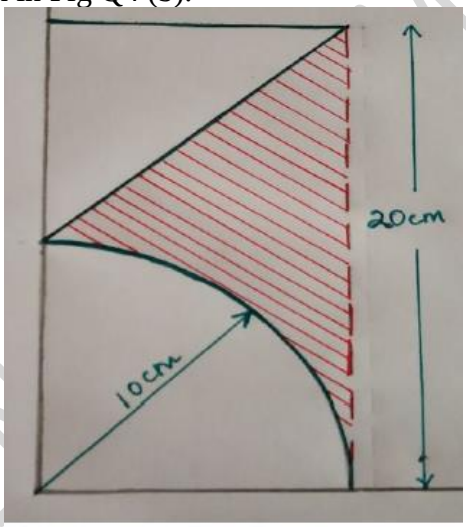

Fig Q4 (b)

OR

5 a) Locate the centroid of area shown Fig Q5 (a) with respect to the cartesian co-ordinate system indicated. **12**

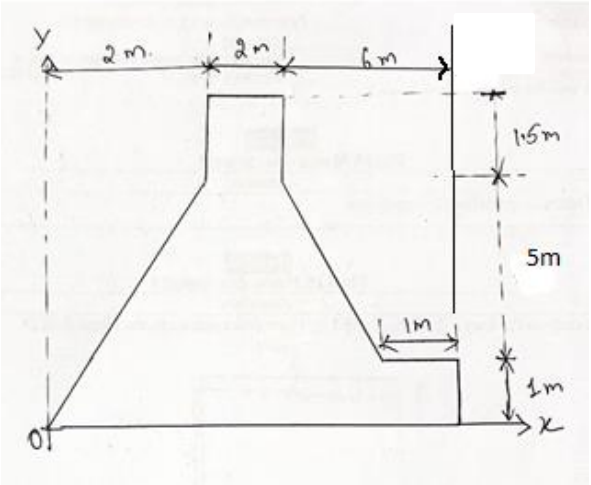

Fig Q5 (a)

b) Determine the moments of inertia of a triangle about its base and about centroidal axis parallel to base. **08**

MODULE - IV

6 a) A block of weight 10 KN rests on a inclined plane which makes an angle of 30^0 with horizontal. Find the least horizontal force required to be applied to ; **10**

(i) Move the block up the plane

(ii) Prevent the block from sliding down the plane.

Assume co efficient of friction as 0.15 for the plane and the block

b) A uniform ladder 4m long weighs 200N. It is placed against a wall making an angle of 60^0 with the floor as shown in Fig Q6 (b) The coefficient of friction between the wall and the ladder is 0.25 and that between the ground and the ladder is 0.35. The ladder in addition to its own weight, must support a man of 1000N at the top at B. calculate the horizontal force P to be applied to the ladder at the ground level to prevent slipping. **10**

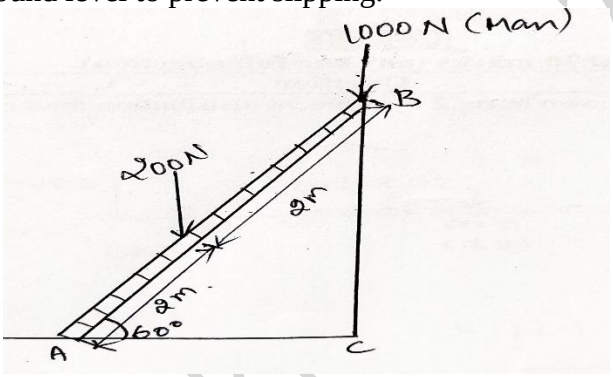

Fig Q 6 (b)

MODULE - V

7 a) Briefly explain the scope of the following branches of civil engineering. **15**

(i) Structural Engineering (ii) Geotechnical Engineering

(iii)Environmental Engineering

b) Discuss the importance of Civil Engineering infrastructure in the development of nation's economy **05**

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