U.S.N.										

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

Autonomous Institute Affiliated to VTU

May 2023 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 **Date: 16.05.2023**

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) Two forces are acting on a structure at a point 'O' as shown in Fig Q 1(a) below. Determine the resultant force acting on the structure. **08**

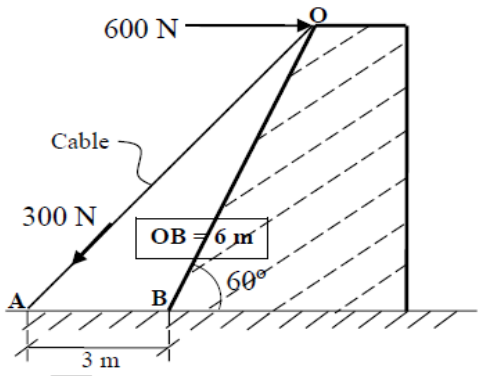

Fig Q 1(a)

b) Two smooth circular cylinders each of weight W = 445 N and radius r = 152 mm, are connected at their centres by a string AB of length l = 406 mm and rest upon a horizontal plane. Supporting above them is a third cylinder of weight Q = 890 N and radius r = 152 mm. Find the forces in the string and the reactions produced on the floor at the points of contact of D and E. Assume all contact surface to be smooth. Refer Fig Q 1(b). **06**

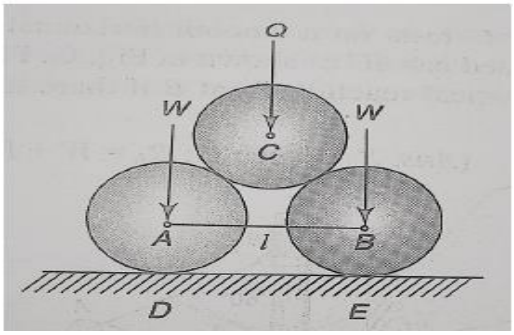

Fig Q 1(b)

c) In the Fig Q 1(c) shown, determine the magnitude and direction of the unknown force such that the resultant of the force system has a magnitude of 2.5 kN and acts horizontally to the right. **06**

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

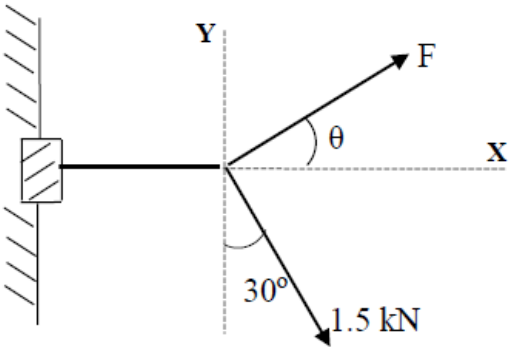

Fig Q 1(c)

OR

2 a) State and explain the principle of transmissibility of a force and principle of superposition of forces. **04**

b) A dam is subjected to three forces; 50kN horizontal force on the upstream vertical face AB, 20kN force acting normally on the downstream inclined face and its own weight of 140kN as shown. Determine the single equivalent force and locate its point of intersection with the base AC, assuming all forces to lie in the same plane. Refer Fig Q 2(b). **08**

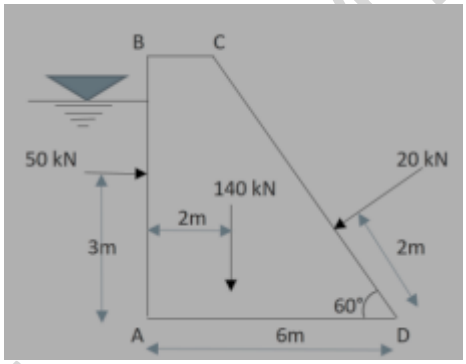

Fig Q 2(b)

c) Determine the resultant force with respect to point 'O' of the force system shown in Fig Q 2(c). Each grid measures 1m x 1m. **08**

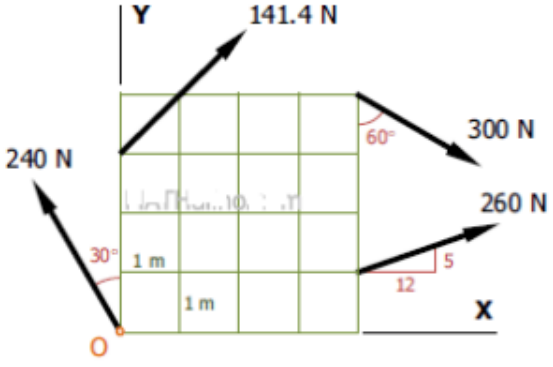

Fig Q 2(c)

MODULE - II

3 a) Determine the forces in all members of the truss shown in Fig Q 3(a) by method of joints and tabulate the results. **12**

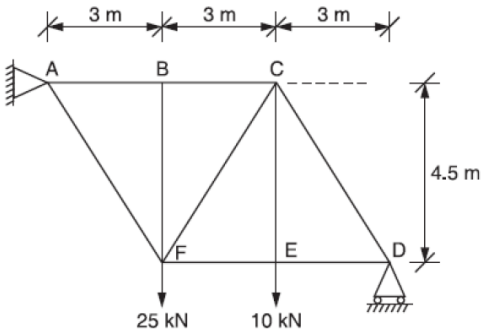

Fig Q 3(a)

b) A beam 6 m long is subjected to loads as shown in Fig Q 3(b). Determine the reactions at the supports. **08**

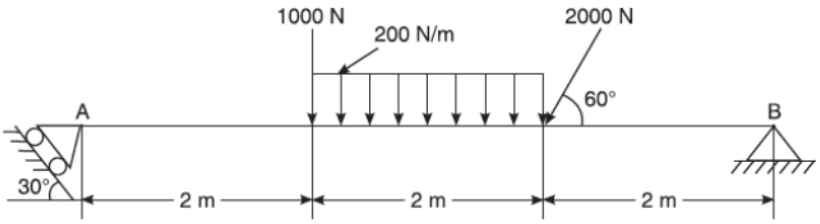

Fig Q 3(b)

MODULE - III

4 a) Derive the expression for the centroid of a quadrant of a circle by using method of integration **08**

b) Find the radius of gyration of the area shown in the Fig Q 4(b) with respect to the polar axis passing through the centroid. **12**

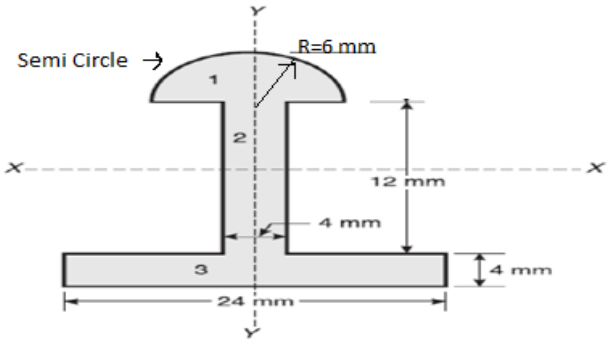

Fig Q 4(b)

OR

5 a) Locate the centroid of the shaded area shown in Fig Q 5(a) with respect to the X and Y axes as shown. **07**

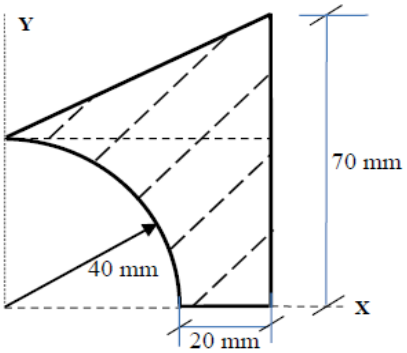

Fig Q 5(a)

b) Calculate the moments of inertia of the plane lamina shown in Fig Q 5(b) w.r.t the horizontal axis and vertical axis passing through the centroid. Take units in mm. **13**

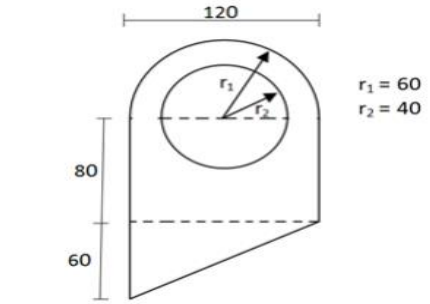

Fig Q 5(b)

MODULE - IV

6 a) Explain angle of friction and angle of repose with neat sketches **04**

b) A ladder of weight 50kN rests with its upper end against a vertical wall and its lower end on a horizontal floor, so that it is inclined at 60^0 with the floor. The co-efficient of friction between wall and ladder is 0.25 and that between the floor and ladder is 0.35. When a man of weight 80kN stands at 3m measured along the ladder from the foot of the ladder, it is at the verge of slipping. Determine the length of the ladder. **08**

c) Determine the least force P required for moving the block shown in Fig Q 6(c). The weight of the wedge may be neglected. The weight of the block is 100 kN. The angle of limiting friction for all contact surfaces may be taken as 15^o. **08**

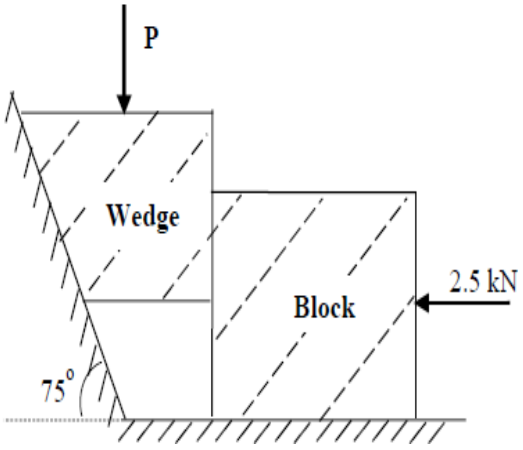

Fig Q 6(c)

MODULE - V

7 a) Briefly explain the scope of the following branches of Civil Engineering. **15**
i) Earthquake Engineering
ii)Water resources and irrigation Engineering
iii)Construction technology

b) Explain the role of a civil engineer in infrastructural development of the nation. **05**

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