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15CIV13/23

**First/Second Semester B.E. Degree(CBCS)Examination**

**Elements of Civil Engineering and Engineering Mechanics**

Time: 3 hrs.

Max. Marks: 80

**Note: Answer any FIVE full questions, choosing one full question from each module.**

**Module-1**

- 1 a. Explain briefly the role of Civil Engineers in the infrastructure development of a country. (06 Marks)
- b. Draw typical cross section of a road and explain its components. (06 Marks)
- c. Define Couple. Explain its characteristics. (04 Marks)

**OR**

- 2 a. Explain briefly the scope of the following Civil Engineering fields.  
i) Structural Engineering ii) Geotechnical Engineering. (04 Marks)
- b. Distinguish between gravity dams and arch dams, with neat sketches. (05 Marks)
- c. Replace the force and couple system by an equivalent force and moment at 'A' shown in fig.Q2(c) (07 Marks)

**Module-2**

- 3 a. Two locomotives moving on opposite banks of a canal can pull a vessel parallel to the banks by means of two ropes. The force in the ropes are 20kN and 24kN, while the total angle between them is  $60^\circ$ . Find the resultant pull on the vessel and the angles  $\alpha$  and  $\beta$ . (08 Marks)
- b. State and prove parallelogram law of forces. (08 Marks)

**OR**

- 4 a. State and prove Lami's theorem. (04 Marks)
- b. Explain with sketches i) Cone of friction ii) Angle of repose. (04 Marks)
- c. Find the magnitude, direction and position of the resultant with respect to the point 'A' for the force system shown in the fig.Q4(c). (08 Marks)

**Module-3**

- 5 a. State and prove Varignon's theorem. (05 Marks)
- b. Explain the different types of loads in the analysis of beams. (03 Marks)
- c. Determine the support reactions in the simply supported beam shown in the fig.Q5(c). (08 Marks)

**OR**

- 6 a. Calculate the support reactions at A, for the beam shown in fig. Q6(a). The beam is hinged at point A and supported by cable CD. Self – weight of the beam is 2kN/m (udl) as indicated. (08 Marks)
- b. Determine the reactions at the contact points in the fig.Q6(b). (08 Marks)

**Module-4**

- 7 a. State and prove parallel axis theorem. (08 Marks)
- b. Determine the centroid of the lamina shown in fig. Q7(b). (08 Marks)

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.

OR

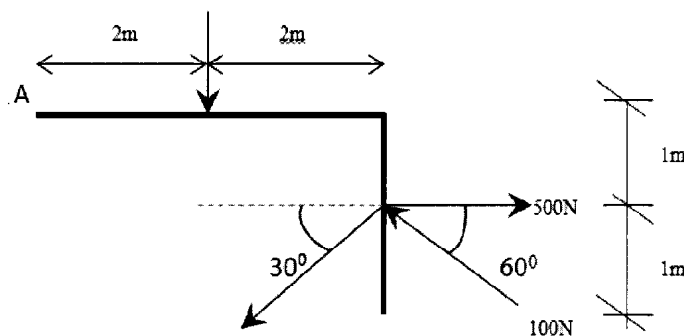
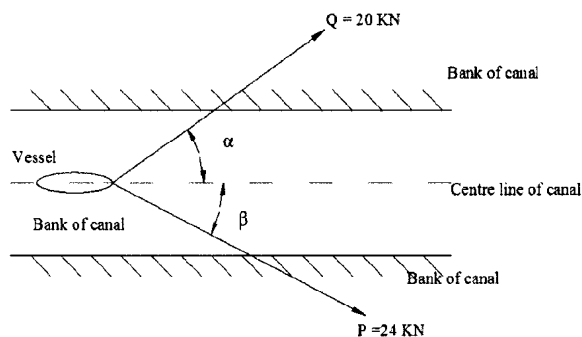
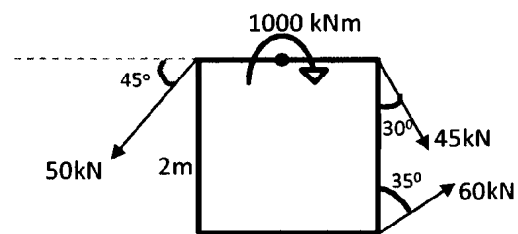
- 8 a. Determine the moment of inertia of the shaded area shown in fig. Q8(a) about the x-x axis. (08 Marks)  
 b. Derive the expressions of centroid of a semi – circle by method of integration. (08 Marks)

**Module-5**

- 9 a. Define i) Displacement ii) Velocity iii) Speed iv) Acceleration. (04 Marks)  
 b. What is Super elevation and what is its necessity? (04 Marks)  
 c. A projectile is fired from the top of a cliff 150m height with an initial velocity of 180m/sec at an upward angle of  $30^\circ$  to horizontal. Neglecting air resistance determine the horizontal distance from the gun point to the point where the projectile strikes the ground. (08 Marks)

OR

- 10 a. Two objects A and B are projected vertically at 130m above the ground level. A is projected up with a velocity of 30m/sec and B is projected downwards with the same velocity. Find the time taken by each object to reach the ground. (08 Marks)  
 b. A pulley 300mm in diameter is wound round by a rope with one of the ends of rope fixed to pulley and the other end is fixed to a weight freely hanging as shown in fig.Q10(b). The weight moves down by 8m after starting from rest in 4 seconds. Find the angular velocity of the pulley. Find also the total distance moved by the weight to make the pulley to rotate 400 revolutions. (08 Marks)

**Fig 2(c)****Fig 3(a)****Fig 4(c)**

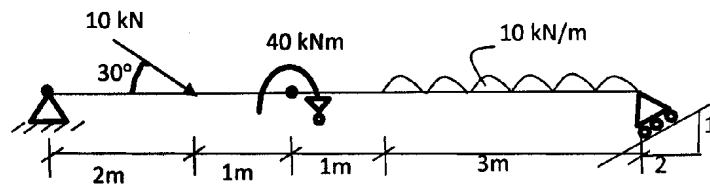


Fig 5(c)

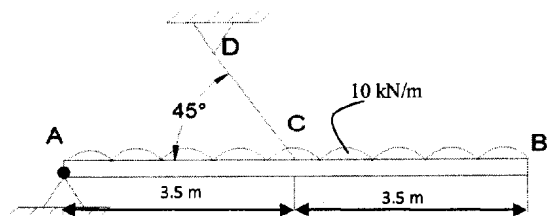


Fig 6(a)

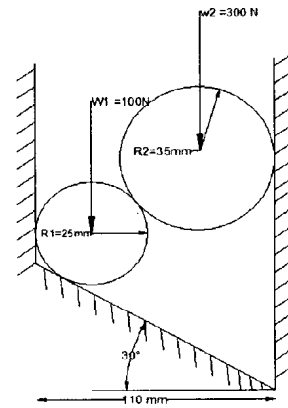


Fig 6(b)

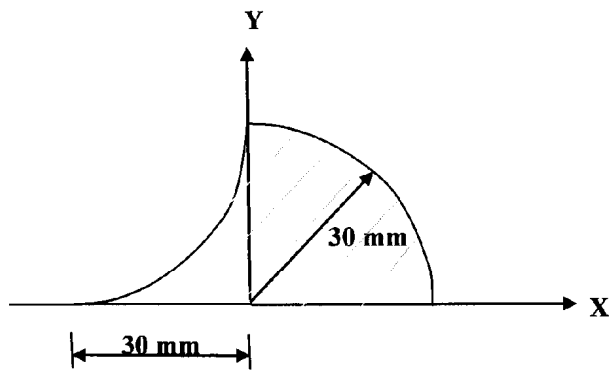


Fig 7(b)

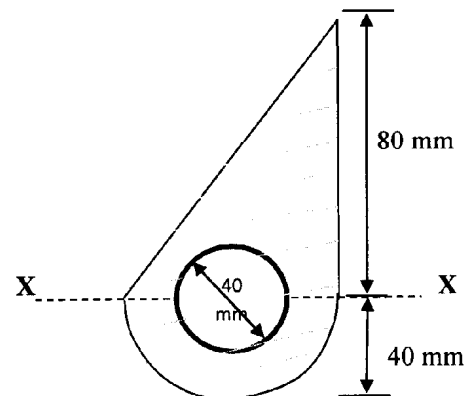


Fig 8(a)

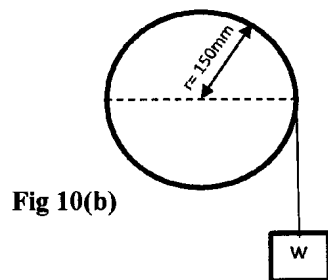


Fig 10(b)

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