

CBCS SCHEME

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First/Second Semester B.E. Degree Examination, E 4, of E. - 9/Jan.2020 Elements of Civil Engineering and Mechanics

Time: 3 hrs.

Max. Marks: 80

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Missing data suitably be assumed.*

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. A 100N vertical force is applied to the end of a lever which is attached to a shaft as shown in Fig. Q. 1(c). Determine:
 - i) Moment of force about 'O'
 - ii) The horizontal force applied at 'A' which creates same moment about 'O'. (04 Marks)

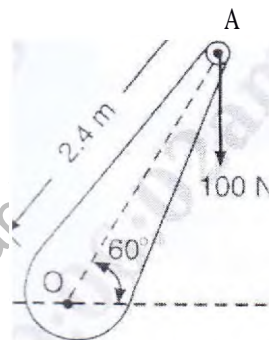


Fig.Q. 1 (c)

OR

- 2 a. Reduce the system in Fig.Q.2(a) to
 - i) Single force
 - ii) Single force and couple at A
 - iii) Single force and couple at B

KN 30 kN 40 kN

(06 Marks)

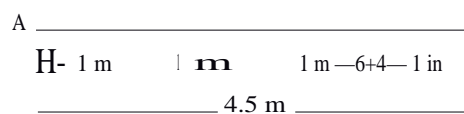


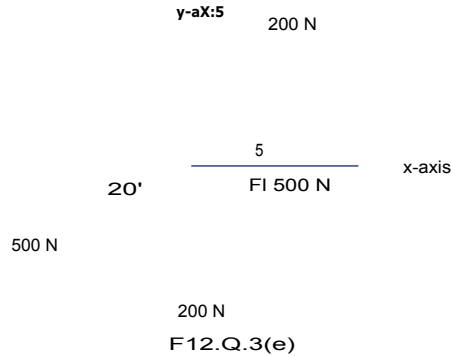
Fig.Q.2(a)

- b. Define couple. Explain its characteristics. (04 Marks)
- c. Distinguish between Gravity Dam and Earthen Dam. (06 Marks)

Module-2

- 3 a. State and prove parallelogram law of forces. (06 Marks)
- b. State the laws of static friction. (04 Marks)

- c. Four coplanar forces acting at a point are as shown in Fig.Q.3(c). One of the forces is unknown and its magnitude is as shown by F. The resultant is 500N and is along x-axis. Determine the force 'F' and its inclination θ with x-axis. (06 Marks)



OR

- 4 a. State and prove Lami's theorem. (04 Marks)
- b. Determine the reactions at the point of contact for the sphere shown in Fig.Q.4(b). (04 Marks)

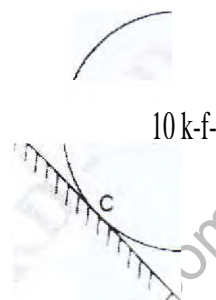


Fig.Q.4(b)

- c. Determine the force P required to cause motion of blocks to impend. Take the weight of A as 90N and weight of B as 45N. Take the coefficient of friction for all contact surfaces as 0.25. Consider the pulleys as frictionless (Fig.Q.4(c)). (08 Marks)

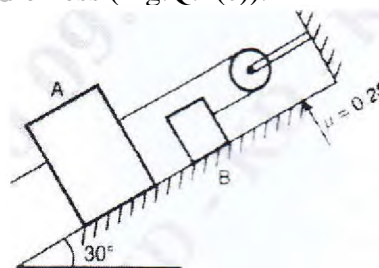


Fig.Q.4(c)

Module-3

- 5 a. State and prove Varignon's theorem. (06 Marks)
- b. Find the reactions for the beam supported and loaded as shown in Fig.Q.5(b). (10 Marks)

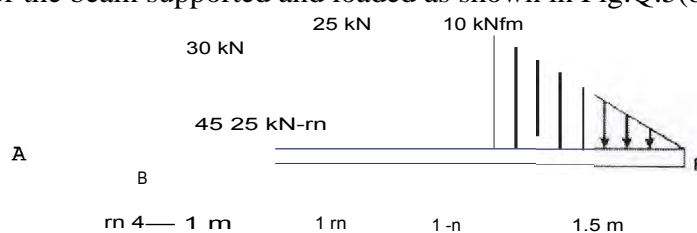


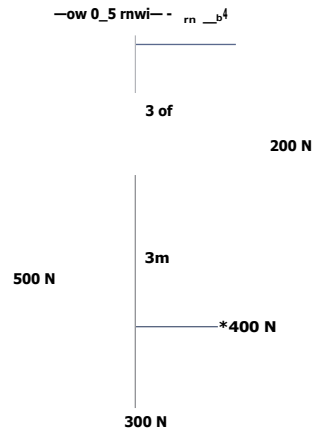
Fig.Q.5(b)

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OR

- a. Explain different type of supports with sketches and reactions. (06 Marks)
- b. Determine the resultant of the four forces acting on a frame as shown in Fig.Q6(b) with respect to point 'CY'. (10 Marks)

Fig.Q.6(b)



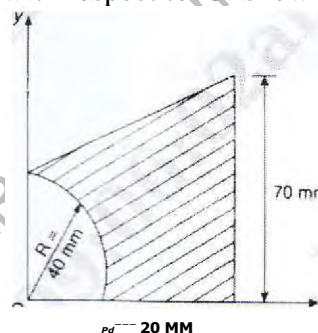
Module-4

- 7 a. Derive an expression for the centroid of semicircle with respect to base. (06 Marks)
- b. Compute the Radii of gyration about its centroidal axes Fig.Q.7(b). (10 Marks)

OR

- 8 a. Derive an expression for the moment of inertia of a quadrant about its centroidal axes. (08 Marks)
- b. Determine the position of centroid with respect to 'Cr shown in Fig.Q.8(b). (08 Marks)

Fig.Q.8(b)



Module-5

- 9 a. What is 'Projectile'? Define the following term briefly: i) Angle of projection ii) Horizontal range iii) Vertical height • and iv) Time of flight. (08 Marks)
- b. A stone is thrown vertically upward from the top of tower 20m high with a velocity of 15m/s. Find: i) The highest elevation reached by the stone ii) The time required for the stone to cross the top of tower during its downward motion and corresponding velocity. (08 Marks)

OR

- 10 a. What is super elevation? What is its purpose? (04 Marks)
- b. The particle moves along a curve of characteristic $x = 0.65y^2$. Its value of motion is $x = 4r^2$ at the instant when $t = 3s$. Determine: i) The displacement of particle from origin ii) The velocity of particle .iii) The acceleration of particle. (06 Marks)
- C. The acceleration of a particle is defined by $a = -3m/s^2$ if $V = 9m/s$ and $V = 9m/s$ and $x = 0$ when $t = 0$. Determine: i) Velocity ii) Distance travelled at $t = 9s$. (06 Marks)

Date: 14/01/2020

Timing: 9.30 a.m. to 12 10 p.m.

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First/Second Semester B.E. Degree Examination, iff 19/Jan.2020
Elements of Civil Engineering and Mechanics

Q.7(b) Compute the Radii of gyration about its centroidal axes Fig.Q.7(h).

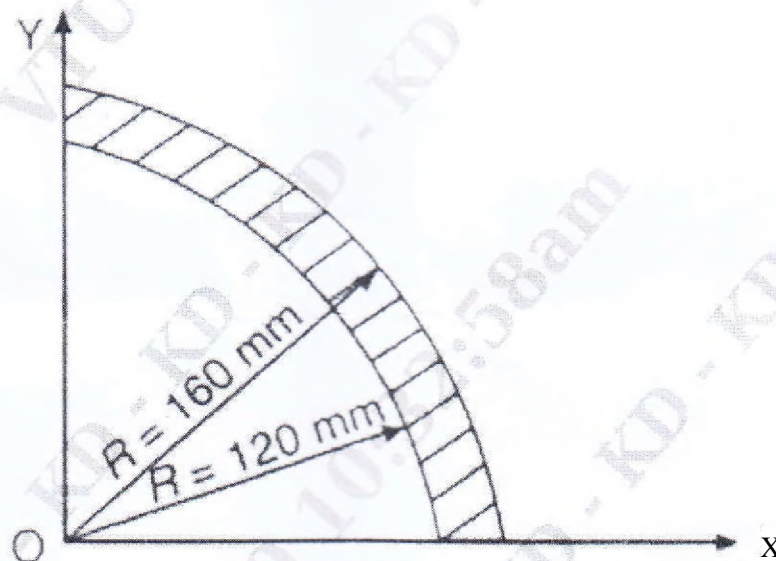


Fig.Q.7(b)

(10 Marks)