

CBCS SCHEME

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17CIV13/23

First/Second Semester B.E. Degree Examination, Dec.2018/Jan.2019

Elements of Civil Engineering and Mechanics

Time: 3 hrs.

Max. Marks: 100



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

Module-1

- 1 a. Explain briefly scope of civil engineering in, i) Structural Engineering ii) Transportation Engineering. (06 Marks)
- b. Explain briefly the impact of infrastructure on the socioeconomic development of country. (06 Marks)
- c. State and explain different elements of force. (04 Marks)
- d. Find the moment of force $F = 600\text{N}$ about 'A' as shown in Fig.Q.1(d). (04 Marks)

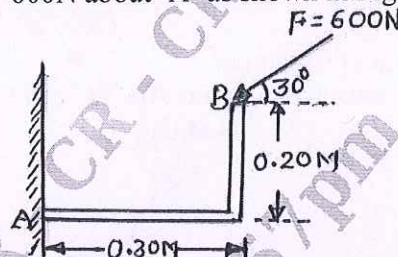


Fig.Q.1(d)

OR

- 2 a. State and explain principle of transmissibility of forces. (04 Marks)
- b. Differentiate between flexible pavement and rigid pavement. (04 Marks)
- c. A block of 200N is kept on the inclined plane and is fixed to the plane. Find the components of weight in the direction along the plane and perpendicular to the plane as indicated in Fig.Q.2(c). (06 Marks)

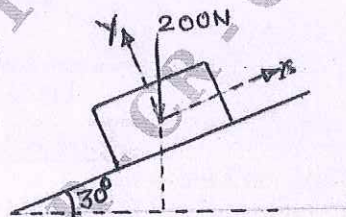


Fig.Q.2(c)

- d. Replace the horizontal force of 600N acting on the lever by an equivalent system consisting of a force and a couple at 'O' as shown in Fig.Q.3. (06 Marks)

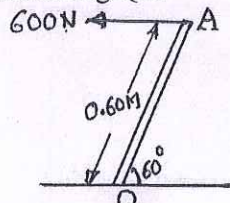


Fig.Q.2(d)

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.

Module-2

- 3 a. State and prove law of parallelogram of forces. (06 Marks)
- b. Explain with neat diagram,
 i) Coefficient of friction
 ii) Angle of repose
 iii) Cone of friction. (06 Marks)
- c. The four coplanar concurrent forces acting at a point are as shown in Fig.Q.3(c). One of the force is unknown and its magnitude is as shown by 'F'. The resultant of these forces is 5kN and is acting along x-axis. Determine the force F and its inclination ' θ ' with x-axis. (08 Marks)

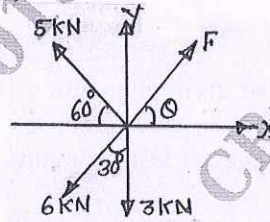


Fig.Q.3(c)

OR

- 4 a. State and prove Lami's theorem. (04 Marks)
- b. Compute the tensions in the strings AB, BC and CD as shown in Fig.Q.4(b). (08 Marks)

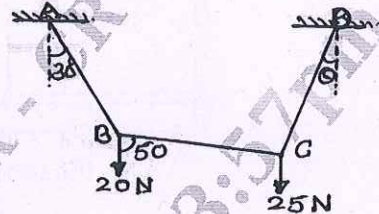


Fig.Q.4(b)

- c. Two blocks A and B weighing 2kN and 1.5kN are connected by a wire passing over a smooth frictionless pulley as shown in Fig.Q.4(c). Determine the magnitude of force 'P' required to impound motion. Take $\mu = 0.20$. (08 Marks)

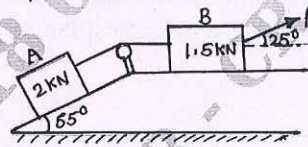


Fig.Q.4(c)

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Module-3

- 5 a. State and explain Varignon's theorem. (06 Marks)
- b. What are the types of loads and supports a beam may have? Explain briefly with neat sketches. (06 Marks)
- c. Determine the position, magnitude and direction of resultant of the forces acting on a body as shown in Fig.Q.5(c) with respect to point A. (08 Marks)

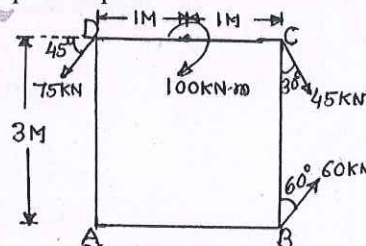


Fig.Q.5(c)

OR

- 6 a. Define Equillibrant. Explain the conditions of equilibrium of coplanar concurrent force system and coplanar non concurrent force system. (06 Marks)
- b. Find the reactions for a cantilever beam as shown in Fig.Q.6(b) (06 Marks)

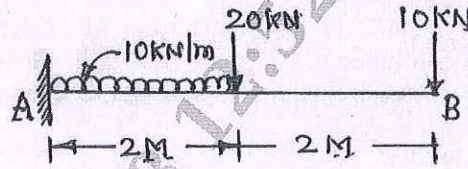


Fig.Q.6(b)

- c. Determine the support reactions for the overhanging beam as shown in Fig.Q.6(c). (08 Marks)

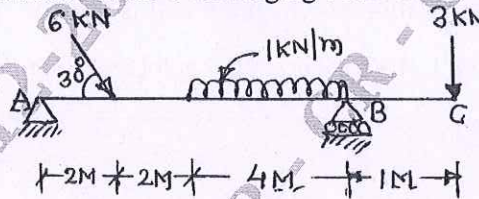


Fig.Q.6(c)

Module-4

- 7 a. Determine the centroid of a semicircular lamina of radius 'R' by the method of integration. (08 Marks)
- b. Find the polar moment of inertia of the section as shown in Fig.Q.7(b), about an axis passing through its centroid and find polar radius of gyration. (12 Marks)

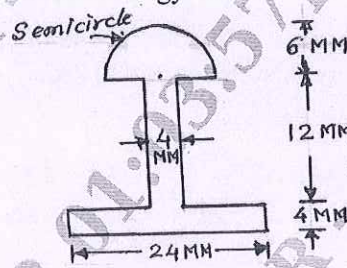


Fig.Q.7(b)

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OR

- 8 a. State and prove parallel axis theorem. (06 Marks)
- b. With reference to the coordinate axes x and y, locate the centroid of the area shown in Fig.Q.8(b). (14 Marks)

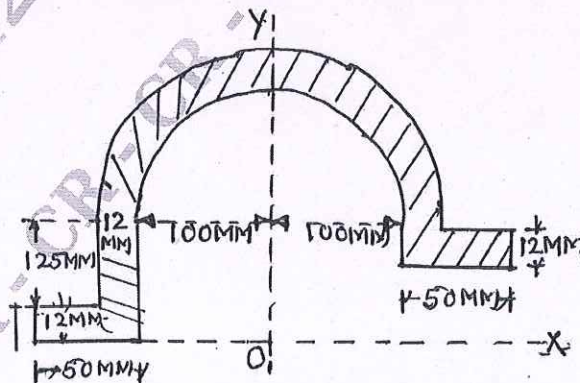


Fig.Q.8(b)

Module-5

- 9 a. Define the following: i) Kinematics ii) Kinetics iii) Motion iv) Path. (06 Marks)
 b. What is centrifugal force and super elevation? (06 Marks)
 c. A Burglar's car starts at an acceleration of 2m/sec^2 . A police vigilant party came after 5 seconds and continued to chase the Burglar's car with a uniform velocity of 20m/sec . Find the time taken in which the police van will overtake the car. (08 Marks)

OR

- 10 a. Define the following: i) Uniform velocity ii) Rectilinear motion iii) Curvilinear motion iv) Projectile. (04 Marks)
 b. Determine the position at which the ball is thrown up the plane will strike the incline plane as shown in Fig.Q.10(b). The initial velocity is 30m/sec and angle of projection is $\tan^{-1}\left(\frac{4}{3}\right)$ with horizontal. (08 Marks)

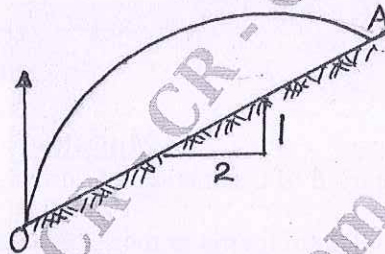


Fig.Q.10(b)

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- c. A stone is dropped into a well and a sound of splash is heard after 4 seconds. Find the depth of well if the velocity of sound is 350m/sec . (08 Marks)
