CBCS SCHEME

USN 4 NI 15 CV 008 15CIV13/23

First/Second Semester B.E. Degree Examination, June/July 2016

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. What is the role played by a Civil Engineer in the infrastructure development of a country? (08 Marks)

b. Replace the force couple system by a single force with respect to AB and CD as shown in fig.1(b). (06 Marks)

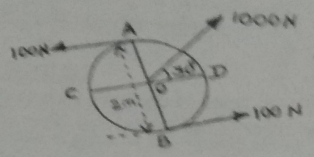

Fig.Q1(b)

c. Define Moment of a Force. (02 Marks)

2 a. What is the scope of (1) Environmental Engineering (2) Surveying? (06 Marks)

b. Distinguish between Rigid pavement and Flexible pavement. (06 Marks)

c. Fig.Q2(c) shows a cantilever beam with two forces and a couple i) Determine the resultant of a system ii) Determine an equivalent system through A. (04 Marks)

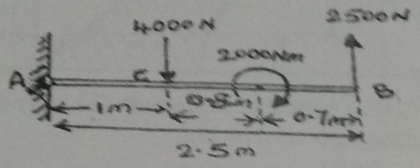

Fig.Q2(c)

MODULE - 2

3 a. Define the following : i) Equilibrant ii) Resultant force iii) Angle of friction iv) Angle of Repose. (08 Marks)

b. A vertical mast AC as shown in fig.Q3(b) supports two cables with tension 3kN and 7kN at the angles shown. BC is a guy wire to be situated at a distance X from the mast base. The resultant of the force system is limited to 2kN maximum and must acts vertically down the mast. Calculate the value of the distance X. (08 Marks)

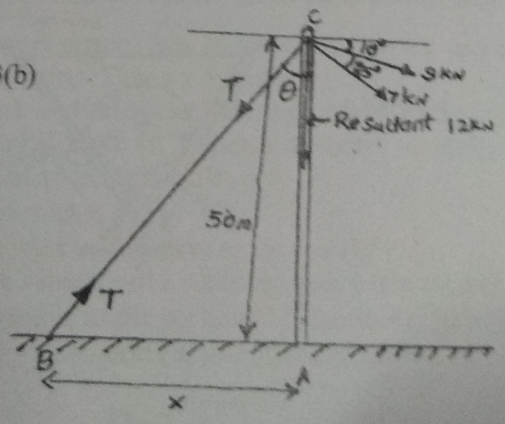

Fig.Q3(b)

The cable tention 3kN, 7kN, R = 12kN

4 a. Explain different types of frictions. (04 Marks)

b. State and prove Lami's theorem. (04 Marks)

c. Figure Q4(c) shows two blocks along with values of μ. Determine the force Q to be applied for impending motion between A and B. Will this force cause movement between B and the ground? (08 Marks)

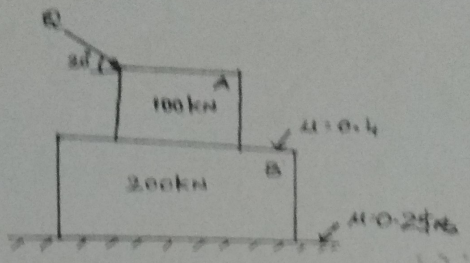

Fig.Q4(c)

MODULE - 3

5 a. Mention the different types of supports with neat sketch. (04 Marks)

b. Explain different types of horizontal members which generally placed on supports. (04 Marks)

c. Determine the reactions at A and B of the overhanging beam as shown in fig. Q5(c). (08 Marks)

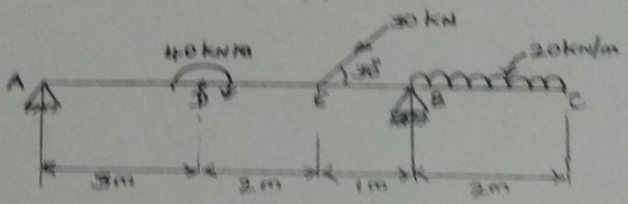

Fig.Q5(c)

6 a. A beam ABCDE is hinged at supports B and has roller at C carries load as shown in fig. Q6(a). Determine supports reactions. (08 Marks)

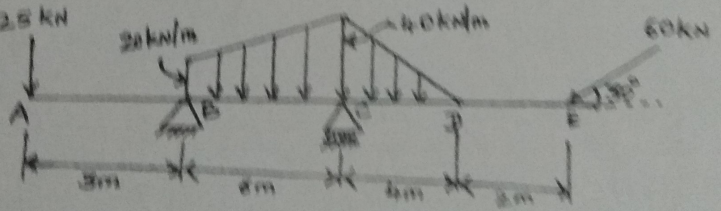

Fig.Q6(a)

b. A cylinder of radius 50mm and weighing 200N is kept in equilibrium portion as shown in fig. Q6(b). Find tension in the string AB and reaction component at hinge O. (08 Marks)

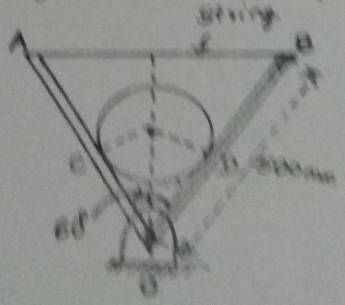

Fig.Q6(b)

7 a. State and prove parallel axis theorem. (06 Marks)

b. Determine the position of centroid of the lamina with circular cutout as shown in fig. Q7(b). (10 Marks)

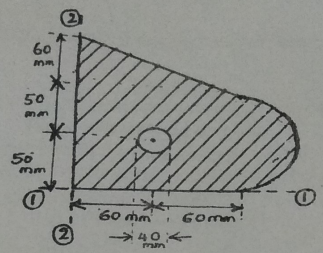

Fig.Q7(b)

MODULE - 4

8 a. Determine Centroid of a triangle by method of Integration. (06 Marks)

b. Find the moment of Inertia of the region in fig. Q8(b) about horizontal axis ①-① and also find the radius of gyration about the same axis. (10 Marks)

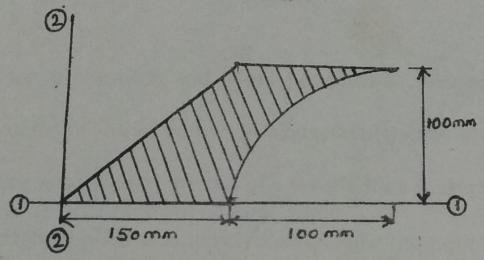

Fig.Q8(b)

MODULE - 5

9 a. Define the following : i) Kinematics ii) Kinetics iii) Motion iv) Path. (04 Marks)

b. What is Super elevation and what is its necessity? (04 Marks)

c. A projectile is projected from a point at an angle of elevation of 30^0 with a velocity of 600m/sec. Find the velocity and direction of motion of the particle at the end of
i) 25 seconds ii) 40 seconds. (08 Marks)

10 a. Define the following : i) Uniform velocity ii) Rectilinear motion iii) Curvilinear motion iv) Projectile. (04 Marks)

b. A particle falling under gravity falls 30 meters in a certain second. Find the time required to cover the next 30 meters. Take $g = 9.8m/sec^2$. (04 Marks)

c. A vehicle carrying a vertical rocket launcher moves to the right at a constant velocity 35m/s along horizontal track. It launches a rocket vertically upwards with an initial velocity of 45m/s relative to the vehicle.
i) How high will the rocket go up?
ii) Where will the rocket land relative to the vehicle?
iii) How far does the vehicle move while the rocket is in the air?
iv) At what angle relative to the horizontal is the rocket travelling just when it leaves the vehicle as observed by an observer at rest on the ground? (08 Marks)

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CBCS Scheme

USN 2VS15MCI038 15CIV13/23

First Semester B.E. Degree Examination, Dec.2016/Jan.2017

Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain briefly the scope of the following civil engineering fields. **(04 Marks)**
i) Hydraulics ii) Transportation engineering.

b. Explain on what bases under which the dams are classified. **(05 Marks)**

c. Replace the horizontal force of 600N acting on the lever by an equivalent system consisting of a force and a couple at 0 as shown in fig.Q1(c). **(07 Marks)**

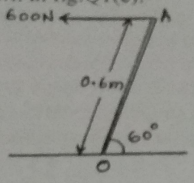


Fig.Q1(c)

OR

2 a. Give the comparison of Flexible and Rigid pavements. Also give their advantages and limitations. **(04 Marks)**

b. List the various systems of forces with their characteristics and an example for each, with a neat sketch. **(05 Marks)**

c. A 100N vertical force is applied to the end of a lever which is attached to a shaft as shown in fig.Q2(c). Determine i) The moment of force about 0.
ii) The horizontal force applied at A which creates same moment about 0.
iii) The smallest force applied at A which creates same moment about 0. **(07 Marks)**

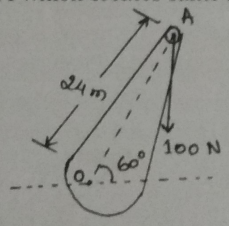


Fig.Q2(c)

Module-2

3 a. State and prove Parallelogram law of forces. **(05 Marks)**

b. Two forces acting on a body are 500N and 1000N as shown in fig. Q3(b). Determine the third force F such that the resultant of all the three forces is 1000N directed at 45° to the x – axis. **(06 Marks)**

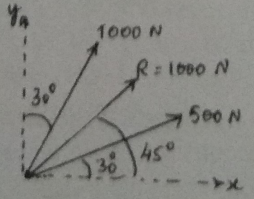
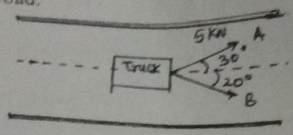


Fig.Q3(b)

c. A truck is to be pulled along a straight road as shown in fig. Q3(c).
i) If the force applied along rope A is 5kN inclined at 30^0, what should be the force in the rope B, which is inclined at 20^0, so that vehicle moves along the road.
ii) If force of 4kN is applied in rope B at what angle rope B should be inclined so that the vehicle is pulled along the road. **(05 Marks)**

Fig.Q3(c)



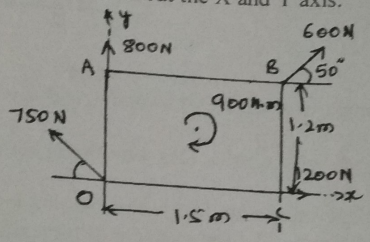
OR

4 a. With a neat sketch, explain the basics of static friction and kinetic friction. **(03 Marks)**

b. A block of mass 10 kgs placed on an inclined plane is subjected a force F which is parallel to the plane. Taking inclination of the plane with respect to the horizontal as 30^0 and coefficient of friction between the block and the plane is 0.24. Determine the value of F for i) Impending motion of the block down the plane and ii) Impending motion of the block up the plane. Take acceleration due to gravity g = 9.81. **(05 Marks)**

c. Find the resultant of the force system acting on a body OABC as shown in fig.Q4(c). Also find the points where the resultant will cut the X and Y axis. **(08 Marks)**

Fig.Q4(c)

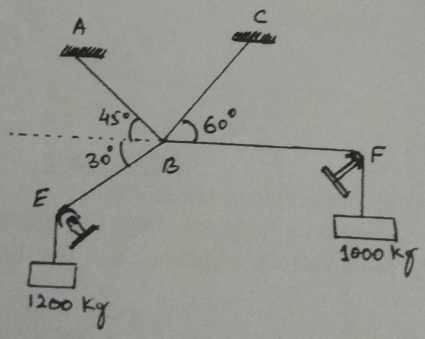


Module-3

5 a. Explain the different types of supports and loads in the analysis of beams. **(06 Marks)**

b. Find the forces in cables AB and CB shown in fig.Q5(b). The remaining two cables pass over frictionless pulleys E and F and support masses 1200 kg and 1000kg respectively. **(10 Marks)**

Fig.Q5(b)

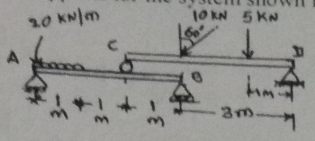


OR

6 a. Define Equilibrant. Explain the conditions for equilibrium of coplanar concurrent force system and coplanar non concurrent force system. **(06 Marks)**

b. Determine the reactions at the supports for the system shown in fig.Q6(b). **(10 Marks)**

Fig.Q6(b)

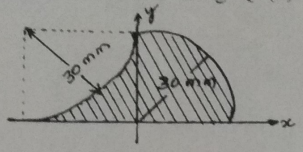


Module-4

7 a. Determine the Moment of inertia of a semi circle about centroid axis parallel to diameter by the method of integration. **(08 Marks)**

b. Determine the centroid of the lamina as shown in fig. Q7(b). **(08 Marks)**

Fig.Q7(b)

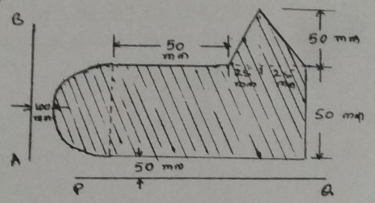


OR

8 a. Determine the centroid for sector of circle by the method of Integration. **(08 Marks)**

b. Find the moment of Inertia of hatched area shown in fig.Q8(b) about the axis PQ. Also determine the radius of gyration. **(08 Marks)**

Fig.Q8(b)



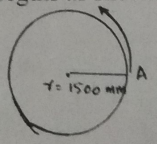
Module-5

9 a. Derive all three basic equations of motion in Kinematics. **(06 Marks)**

b. What is Super elevation and what is its necessity? **(04 Marks)**

c. A horizontal bar on length 1.5m rotates. It accelerates uniformly from 1200 rpm to 1500 rpm in an interval of 5 seconds. Find the linear velocity at the beginning and end of the interval. What are the normal and tangential components of the acceleration at the mid – point of the bar after 4 sec after the acceleration begins as shown in fig. Q9(c)? **(06 Marks)**

Fig.Q9(c)



OR

10 a. Derive the equation to the path of the projectile. **(08 Marks)**

b. A passenger and goods train are moving on a parallel track in same direction. The passenger train 250m length is moving with a constant velocity of 72 kmph. At an instant its engine approaches the last compartment of the goods train. After 25 sec. the engine starts overtaking the engine of goods train. It takes 30 seconds more to completely overtake the goods train. Find the length and speed of goods train. **(08 Marks)**

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