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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)**

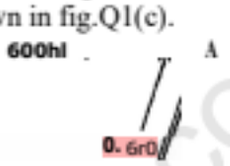


Fig.Q 1(c)

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)**

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)**

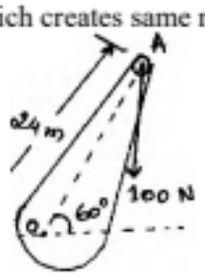


Fig.Q2(c)

Module-2

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

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 ^{0} to the x — axis. **(06 Marks)**

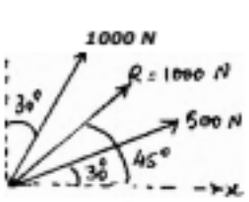
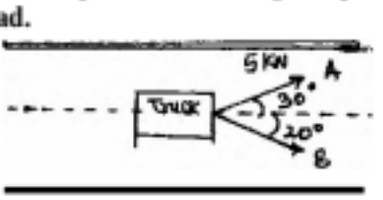


Fig.Q3(b)

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°, what should be the force in the rope B, which is inclined at 20°, so that vehicle moves along the road.
ii) If force of 41(N 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 ° 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 = 9/8 I. (05 Marks)
c. Find the resultant of the force system acting on a body AB in fig.Q4(c). Also find the points where the resultant will cut the X and; (08 Marks)

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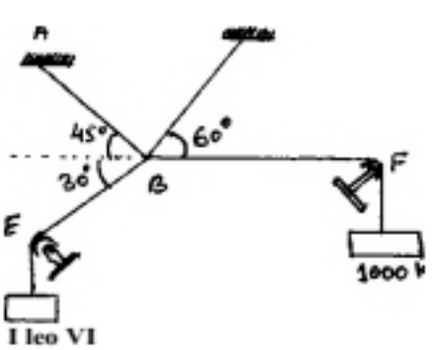
Module-3

5 CO 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)



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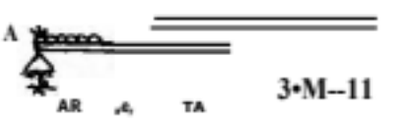
OR

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)



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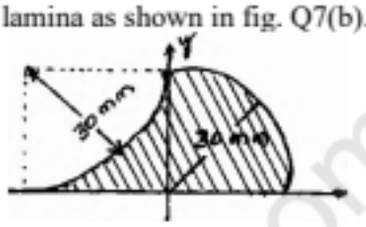
Module-4

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)

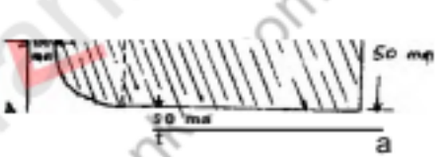


OR

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)



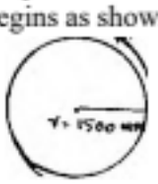
Module-5

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

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)**