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14CIV13/23

First/Second Semester B.E. Degree Examination, Dec.2017/Jan.2018
Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs. Max. Marks: 100

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

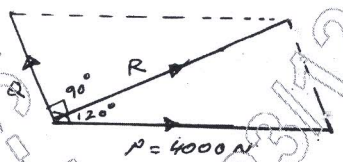
Module-1

1 a. Explain the following fields of Civil Engineering in brief :
i) Structural Engineering ii) Transportation Engineering. **(05 Marks)**

b. With neat sketches, explain any two types of dams. **(05 Marks)**

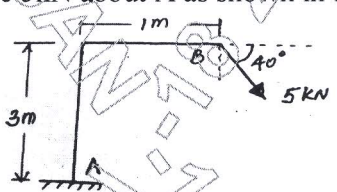
c. Two forces act at an angle of 120^0. The bigger force is 4000N and the resultant is perpendicular to the smaller force. Find the smaller force. Refer fig. Q1(c). **(05 Marks)**

Fig.Q1(c)



d. Determine the moment of force 5kN about A as shown in fig. Q1(d). **(05 Marks)**

Fig.Q1(d)



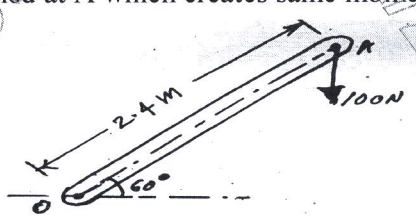
OR

2 a. Explain role of civil engineers in the infrastructural development of a country. **(06 Marks)**

b. Give comparison of flexible and rigid pavements. **(04 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 O.
ii) the horizontal force applied at A which creates same moment about O.
iii) the smallest force applied at A which creates same moment about O. **(10 Marks)**

Fig.Q2(c)

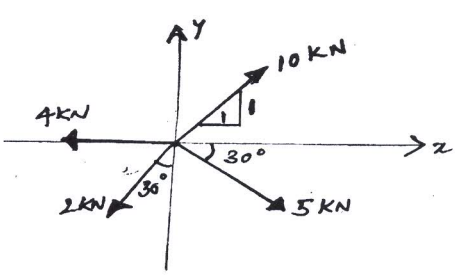


Module-2

3 a. What is resultant? Explain the steps involved in finding the magnitude and direction of resultant of concurrent co-planer system of forces. **(05 Marks)**

b. Determine the magnitude and direction of resultant of concurrent co-planar system of forces shown in fig. Q3(b). **(06 Marks)**

Fig.Q3(b)



c. Determine the magnitude, direction and position of resultant from A on x-axis for the given non concurrent co-planar system of forces shown in fig. Q3(c). **(09 Marks)**

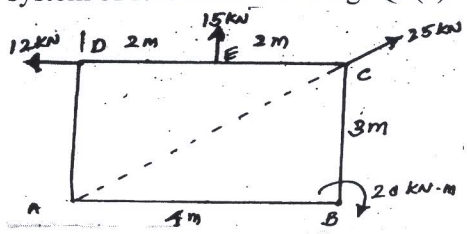


Fig.Q3(c)

OR

4 a. State and prove law of parallelogram of forces. **(06 Marks)**

b. Three force of magnitude 10kN, 15kN and 5kN are acting on a square as shown in fig. Q4(b). Determine the magnitude and direction of their resultant. **(04 Marks)**

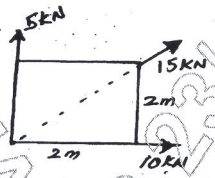


Fig.Q4(b)

c. Determine the magnitude , direction and position of resultant from A along x axis of the system of forces shown in fig. Q4(c). **(08 Marks)**

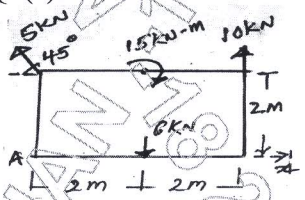


Fig.Q4(c)

d. State Verignon's principle of Moments. **(02 Marks)**

Module-3

5 a. State and prove Lami's theorem. **(06 Marks)**

b. A light string ABCDE whose extremity A is fixed, has weights W_1 and W_2 attached to it at B and C. It passes round a small smooth peg at D carrying a weight of 100N at the free end as shown in fig. Q5(b). If in the position of equilibrium , BC is horizontal and AB and CD makes 150^0 and 120^0 with BC find i) Tension in the portions AB, BC and CD of the string. ii) Magnitudes of W_1 and W_2. **(07 Marks)**

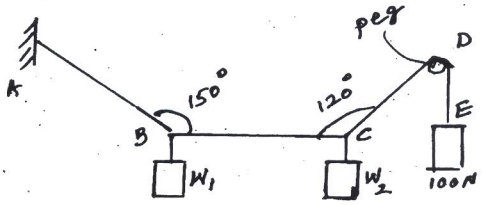


Fig.Q5(b)

c. Determine the support reactions for the beam shown in fig.Q5(c). **(07 Marks)**

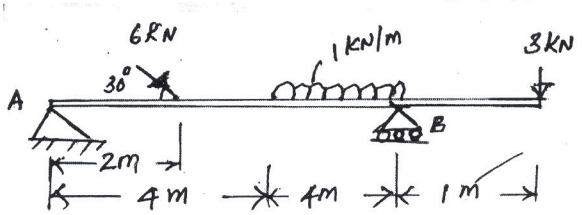
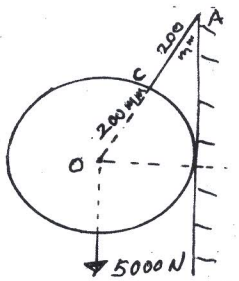


Fig.Q5(c)

OR

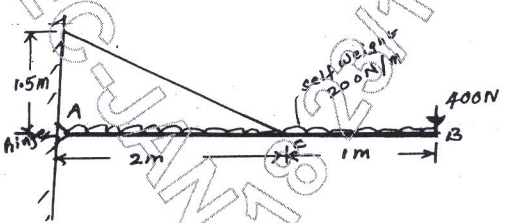
6 a. A circular roller weighing 5000N having radius of 200mm, hangs by a string AC 200mm long as shown in fig. Q6(a). Find the tension in the string and the reaction of the wall. **(05 Marks)**

Fig.Q6(a)



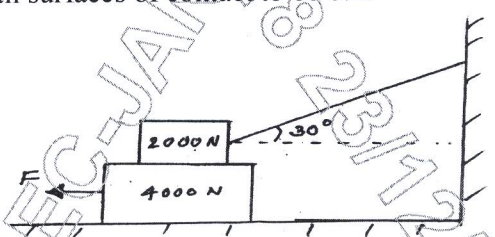
b. A wooden beam weighing 200N/m is supported on a hinged end at A and by a cable CD as shown in fig. Q6(b). It carries a point load of 400N at B. Determine the reaction at A. **(06 Marks)**

Fig.Q6(b)



c. A block weighing 4000N is resting on horizontal surface supports another block of 2000N as shown in fig. Q6(c). Find the horizontal force F just to move the block to the left. Take co-efficient of friction for all surfaces of contact to be 0.2. **(09 Marks)**

Fig.Q6(c)



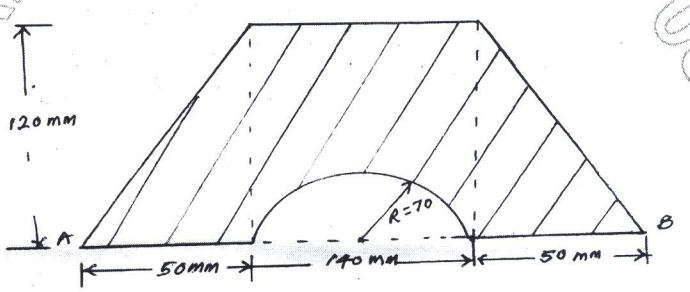
Module-4

7 a. From first principle derive the expression for centroid of a triangle. **(06 Marks)**

b. Define the following : i) Axis of reference ii) Axis of symmetry. **(04 Marks)**

c. Determine the moment of inertia of the plane lamina shown in fig. Q7(c) about base AB. **(10 Marks)**

Fig.Q7(c)



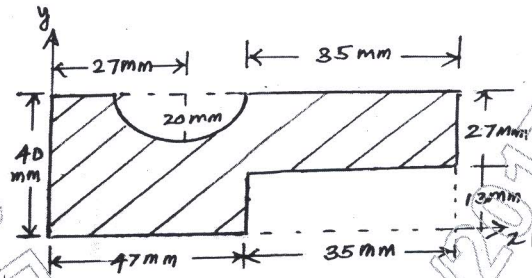
OR

8 a. State and prove perpendicular axis theorem. **(05 Marks)**

b. From first principle derive the equation for moment of inertia of a circle about centroidal axis. **(05 Marks)**

c. Find the centroid of shaded area from reference x and y axis respectively. Refer fig. Q8(c). **(10 Marks)**

Fig.Q8(c)



Module-5

9 a. Define the following terms : i) Velocity ii) Acceleration. **(04 Marks)**

b. An electric train, travelling between two stations 2.0km apart is uniformly accelerated for the first 20 seconds, during which period it covers 200m. It then runs with a constant speed, until it is finally retarded uniformly in the last 150m. Find the maximum speed of the train and the time taken to complete the journey between the two stations. **(09 Marks)**

c. An aircraft moving horizontally at a speed of 720kmph at a height of 1000m towards a target on the ground , releases a bomb which hits the target, find **(07 Marks)**

i) Time required for the bomb to reach the target on the ground and

ii) The horizontal distance of the air-craft from the target when it released the bomb.

OR

10 a. A vehicle is moving with variable acceleration and its motion is given by the equation $S = 25t + 4t^2 - 6t^3$, where s is in m and t is in seconds. Determine :

i) the velocity and acceleration at start.

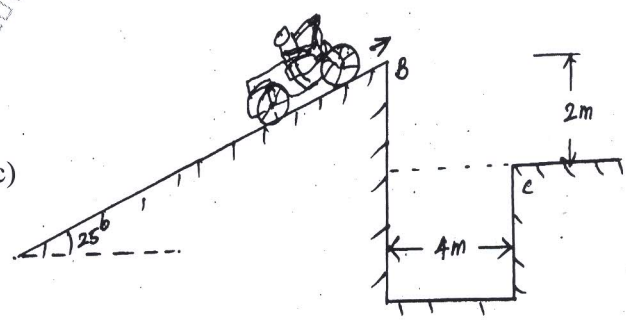
ii) the time when the vehicle reaches its maximum velocity.

iii) the maximum velocity of the vehicle. **(05 Marks)**

b. A ball is dropped from the top of a skyscraper building which is 150m high. After 1 second, another stone is thrown down and strikes the first ball when it has just reached the foot of the building. Find the velocity with which the second ball was thrown. **(07 Marks)**

c. A motorcyclist wants to clear the ditch shown in fig.Q10(c). If the ramp at B is of 25^0, determine the maximum speed of the motorcyclist at B. Motorcycle may be treated as a particle. **(08 Marks)**

Fig.Q10(c)



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