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18CIV14/24

First/Second Semester B.E. Degree Examination, Feb./Mar. 2022 Elements of Civil Engineering and Mechanics

Time: 3 hrs.

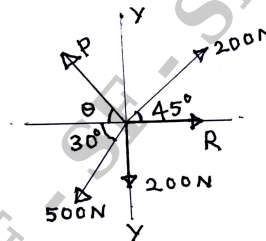
Max. Marks: 100

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

Module-1

- 1 a. Briefly tell about any two fields of Civil Engineering. (04 Marks)
 b. List the role of Civil Engineering in the infrastructural development of a country. (06 Marks)
 c. Four coplanar forces are acting at the point are shown in Fig.Q.1(c). One of the forces is unknown and its magnitude is P. The resultant has a magnitude of 500N and is acting along X – axis. What is the unknown force P and its inclination with X – axis. (10 Marks)

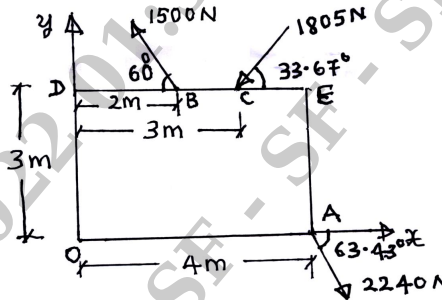
Fig.Q.1(c)



OR

- 2 a. State and explain parallelogram law of forces. (04 Marks)
 b. State and prove Varignon's theorem of moments. (06 Marks)
 c. Fig.Q.2(c) shows coplanar system of forces acting on a flat plate. Determine:
 i) The resultant (10 Marks)
 ii) X and Y intercepts with respect to point 'O'.

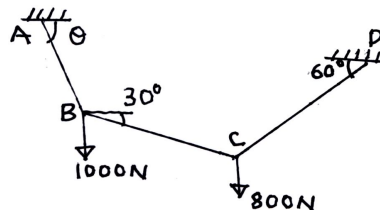
Fig.Q.2(c)



Module-2

- 3 a. Explain free body diagram with sketches. (04 Marks)
 b. State and prove Lami's theorem. (06 Marks)
 c. Compute the unknown angle and tension in the strings AB, BC and CD as shown in Fig.Q.3(c). (10 Marks)

Fig.Q.3(c)



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.

OR

- 4 a. Prove that angle of friction is equal to angle to repose. (06 Marks)
 b. Define:
 i) Limiting friction
 ii) Cone of friction. (04 Marks)
 c. Two blocks A and B of masses 30kg and 40kg respectively are connected by means of a bar placed on a inclined plane as shown in Fig.Q.4(c). If $M = 0.25$, find the value of θ required for the motion of block to impend. (10 Marks)

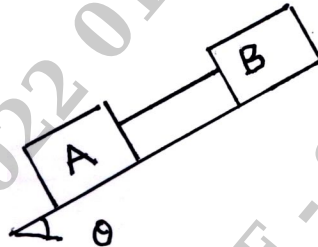


Fig.Q.4(c)

Module-3

- 5 a. Explain the different types of loading with sketches. (06 Marks)
 b. Briefly explain determinate and indeterminate beams. (04 Marks)
 c. A beam AB 1.7m long is loaded as shown in Fig.Q.5(c). Find the reactions at A and B. (10 Marks)

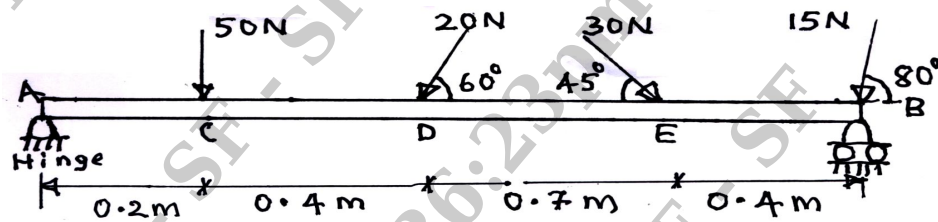


Fig.Q.5(c)

OR

- 6 a. What are the steps to be followed in the analysis of statically determinate trusses by the method of joints? (06 Marks)
 b. Analyze the truss shown in Fig.Q.6(b) by the method of joints. Tabulate the results and indicate the nature of forces in the truss. (14 Marks)

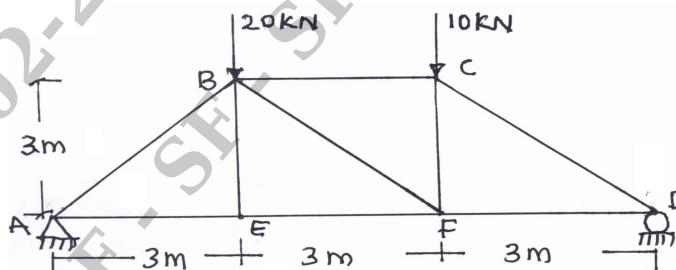


Fig.Q.6(b)

Module-4

- 7 a. State and prove parallel axis theorem. (08 Marks)
 b. Find the centroid for the Fig.Q.7(b) shown below:

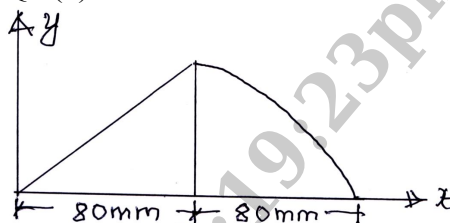


Fig.Q.7(b)

(12 Marks)

OR

- 8 a. Find the centroid of a triangle of base 'b' and height 'h' from first principle. (08 Marks)
 b. Determine the moment of inertia of Fig.Q.8(b) about centroidal X axis and Y axis. (12 Marks)

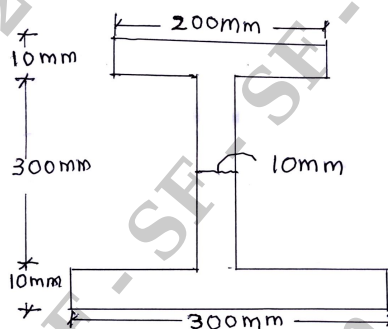


Fig.Q.8(b)

Module-5

- 9 a. Define:
 i) Trajectory
 ii) Time of flight
 iii) Superelevation
 iv) Curve linear motion
 v) Rectilinear motion. (10 Marks)
- b. A tower is 90m in height. A particle is dropped from the top of tower and at the same time another particle is projected upward from the foot of tower. Both the particles meet at a height of 30m with respect to foot of the tower. Find the velocity with which second particle is projected upward. (10 Marks)

OR

- 10 a. State and explain D'Alembert's principle. (08 Marks)
 b. Two weights 800N and 200N are connected by thread and they move along a rough horizontal plane under the action of force of 400N applied to the 800N weight as shown in Fig.Q.10(b). Using D'Alembert's principle, find the acceleration of weights and tension in thread. Take coefficient of friction = 0.3. (12 Marks)

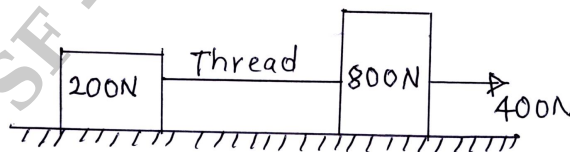


Fig.Q.10(b)
