CBCS SCHEME

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18CIV14/24

First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Missing data, if any, may be suitably assumed.

Module-1

1 a. State the scope of following fields of civil engineering. i) Geotechnical Engineering ii) Transportation Engineering iii) Water Resources and Irrigation Engineering iv) Structural Engineering. **(08 Marks)**

b. State and explain basic concepts of idealization of mechanics. **(04 Marks)**

c. Determine resultant force for the system shown in Fig.Q1(c). **(08 Marks)**

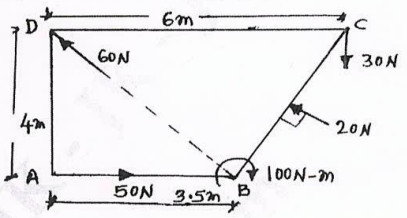

Fig.Q1(c)

OR

2 a. State and explain the effect of infrastructural facilities on social–economic development of a country. **(08 Marks)**

b. State : i) Principle of transmissibility ii) Resolution and composition of forces. **(04 Marks)**

c. Find the angle 'α' if resultant force of the system shown in Fig.Q2(c) is vertical, also find magnitude of resultant force. **(08 Marks)**

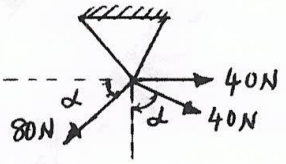

Fig.Q2(c)

Module-2

3 a. State and explain free body diagram with examples. **(04 Marks)**

b. Find tension in string if the system is in equilibrium shown in Fig.Q3(b). **(08 Marks)**

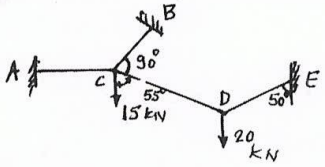

Fig.Q3(b)

c. A uniform ladder weight 850N and length 6m rests on a horizontal ground and leans against a smooth vertical wall. The angle made by the ladder with horizontal is 65°. When man of weight 700N stands on the ladder at a distance of 4m from the top of the ladder, the ladder slides right side. Determine the coefficient of friction between ladder and ground. **(08 Marks)**

OR

4 a. State laws of dry friction. **(04 Marks)**

b. Find contact pressure at surfaces of contact for the system shown Fig.Q4(b) for two identical cylinders P and Q. **(08 Marks)**

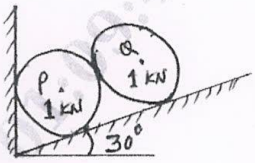

Fig.Q4(b)

c. A block weighing 3kN overlying a 10° wedge on a horizontal floor and leaning against a vertical wall is to be raised by applying a horizontal force to the wedge. Angle of friction between wall and the block as 15° and for other surfaces of contact as 18°. Determine minimum horizontal force to be applied to rise the block shown in Fig.Q4(c). **(08 Marks)**

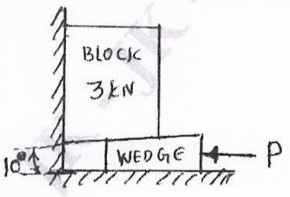

Fig.Q4(c)

Module-3

5 a. Distinguish between :

i) Statically determinate and indeterminate beams with examples

ii) Method of Joints and method of sections. **(06 Marks)**

b. State assumptions made in truss analysis. **(04 Marks)**

c. Find support reactions for the beam shown in Fig.Q5(c). **(10 Marks)**

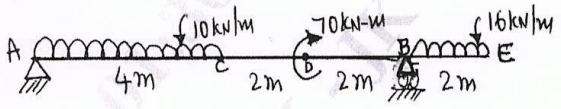

Fig.Q5(c)

OR

6 a. Define support and support reaction and explain different types of supports with neat sketches. **(06 Marks)**

b. Find support reactions for cantilever beams shown in Fig.Q6(b). **(04 Marks)**

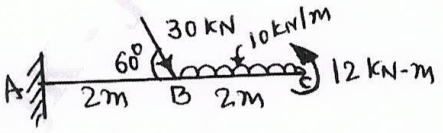

Fig.Q6(b)

c. Find forces in members of truss shown in Fig.Q6(c) using methods of joints and tabulate member forces. **(10 Marks)**

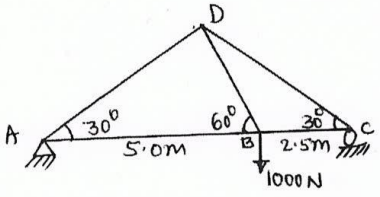

Fig.Q6(c)

Module-4

7 a. Determine second moment area of semicircle about horizontal diametrical axis. **(06 Marks)**

b. State and prove parallel axes theorem. **(04 Marks)**

c. Locate the Centriod of plane area shown in Fig.Q7(c). **(10 Marks)**

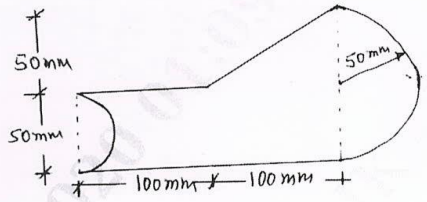

Fig.Q7(c)

OR

8 a. Determine the centriod of triangle of base 'B' and height 'H'. **(06 Marks)**

b. Define : i) Radius of gyration ii) Product of inertia
iii) Centriod iv) Centre of gravity. **(04 Marks)**

c. Find radius of gyration about X-X axis shown in Fig.Q8(c). **(10 Marks)**

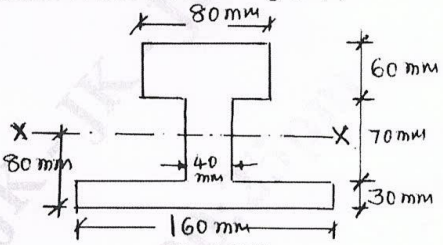

Fig.Q8(C)

Module-5

9 a. State and explain D'Alembert's principle. **(04 Marks)**

b. Define : i) Super elevation and state the importance of super elevation
ii) Displacement, acceleration and instantaneous velocity. **(06 Marks)**

c. A bullet fired upwards at an angle of 30° to the horizontal from top of hill of height 80m and bullet strikes the ground which is 80m lower than the point of projection. If Initial velocity of bullet is 100m/sec. Find :
i) Maximum height the bullet rise above the point of projection
ii) The velocity with which it strikes the ground
iii) Time of flight of bullet. **(10 Marks)**

OR

10 a. State Newton's laws of motion. **(04 Marks)**

b. A body falling freely under the action of gravity passes two points 20m apart vertically in 0.4 seconds. From what height above the higher point the body starts to fall take $g = 9.8 m/sec^2$. **(08 Marks)**

c. A fly wheel rotating at 200rpm and after 10 seconds it rotating at 160rpm. If the retardation is uniform determine number of revolutions made and time taken by flywheel before it comes to rest from the speed of 200 rpm. **(08 Marks)**

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