CBCS SCHEME

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15CV42

# Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
## Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 80

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

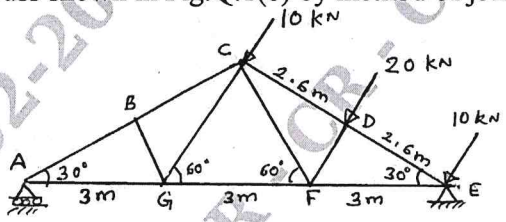
Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

### Module-1

1 a. Briefly explain conditions of equilibrium in structural analysis. **(04 Marks)**

b. Analyze the pin jointed truss shown in Fig.Q.1(b) by method of joints. **(12 Marks)**

Fig.Q.1(b)

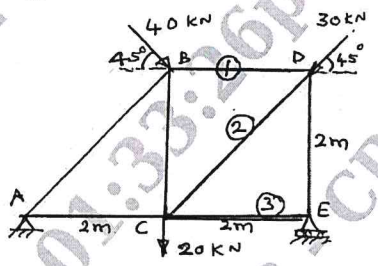



**OR**

2 a. Explain static indeterminacy and kinematic indeterminacy of structures with examples. **(06 Marks)**

b. Find the forces in the numbered members of the loaded truss shown in Fig.Q.2(b) using method of sections. **(10 Marks)**

Fig.Q.2(b)




### Module-2

3 a. Derive the differential equation of a deflection curve for the beam. **(05 Marks)**

b. Compute the maximum deflection for the given beam shown in Fig.Q.3(b) by conjugate beam method. **(11 Marks)**

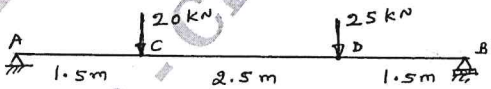
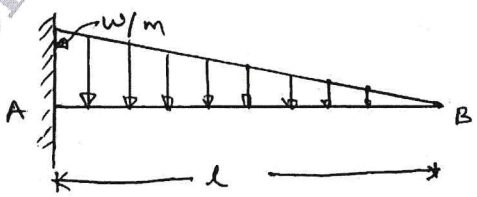



Fig.Q.3(b)

**OR**

4 a. Find the slope and deflection at the free end of the cantilever beam shown in Fig.Q.4(a) by moment area method. **(06 Marks)**

Fig.Q.4(a)



b. A beam of uniform section and 6m long is simply supported at the ends. Two vertical concentrated loads of 48kN and 40kN act at 1m and 3m respectively from the left hand support. Determine the position and magnitude of the maximum deflection. Use Maculay's method. E = 200GPa, I = 85 × $10^6$mm$^4$. **(10 Marks)**

## Module-3

5 a. Derive the expression for the strain energy stored in a member subjected to axial force with usual notations. **(06 Marks)**

b. Determine the vertical and horizontal deflection at 'D' for the frame shown in Fig.Q.5(b) using Castigliano's theorem. EI = 16 × $10^4$kN-m$^2$. **(10 Marks)**

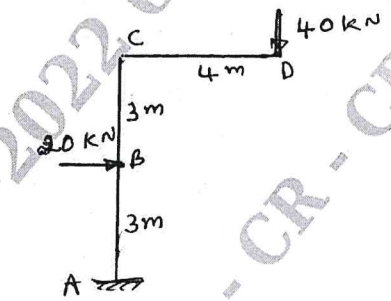



Fig.Q.5(b)

**OR**

6 a. Find the deflection under the 60kN load by unit load method for the beam shown in Fig.Q.6(a) E = 200kN/mm$^2$, I = $10^7$mm$^4$. **(08 Marks)**

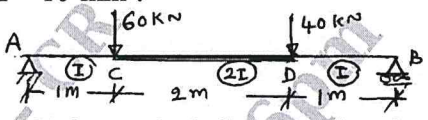



Fig.Q.6(a)

b. Find the deflection of joint 'C' in vertical direction for the pin jointed truss shown in Fig.Q.6(b) E = 200kN/mm$^2$. **(08 Marks)**

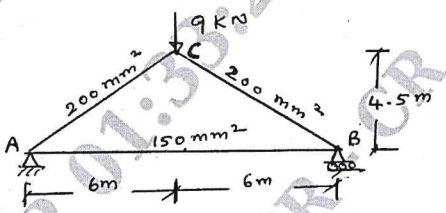



Fig.Q.6(b)

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## Module-4

7 a. Deduce an expression for the length of the cable with supports at same level with usual notations subjected to a udl of W/M run. **(06 Marks)**

b. A three hinged parabolic arch ACB with supports at different levels has a span of 15m and loaded as shown in Fig.Q.7(b). Calculate the horizontal thrust and maximum negative bending moment. **(10 Marks)**

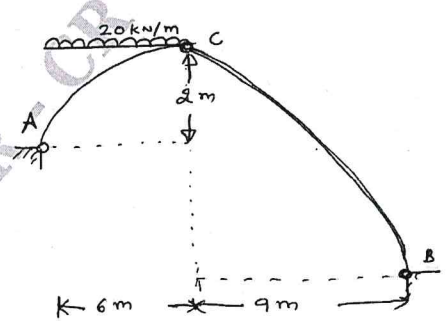


Fig.Q.7(b)

**OR**

8 a. Show that the Bending moment at any section on a three hinged parabolic arch of span '*l*' and rise 'h' carrying an udl of w/m over the entire span is zero. **(06 Marks)**

b. A light flexible cable 18m long is supported at two ends at the same level. The supports are 16m apart. The cable is subjected to the uniformly distributed load of 15kN/m of horizontal length over its entire span. Determine the reactions developed at the support, the tension that occurs at the support and its inclination to the horizontal. **(10 Marks)**

## Module-5

9 a. Find the shear force at X using influence line diagram for the beam shown in Fig.Q.9(a). **(08 Marks)**

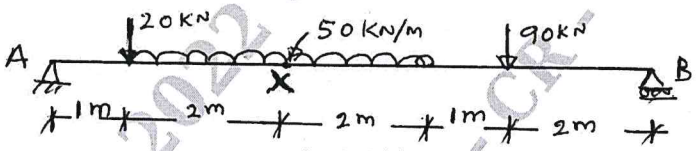


Fig.Q.9(a)

b. The load system shown in Fig.Q.9(b) moves from left to right on a girder of span 12m. Find the absolute maximum bending moment for the girder. **(08 Marks)**

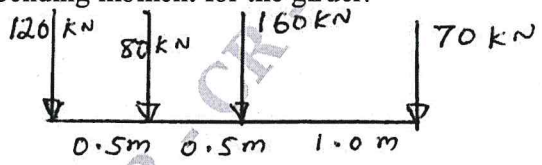


Fig.Q.9(b)

**OR**

10 a. From the first principles, construct influence line diagrams for bending moment and shear force at a section 'C' of a simply supported beam shown in Fig.Q.10(a). **(06 Marks)**

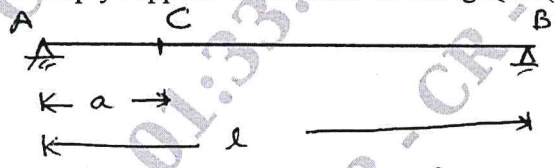


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Fig.Q.10(a)

b. The load system shown in Fig.Q.10(b) moves from left to right on a girder of span 20m. Find the maximum bending moment and shear force at a section 8m from the left hand support. **(10 Marks)**

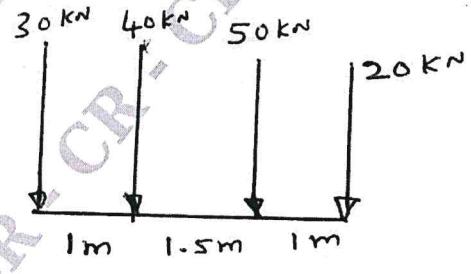


Fig.Q.10(b)

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