## CBCS SCHEME

USN | | | | | | | | | |                                          18CV42

### Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
### Analysis of Determinate Structure

Time: 3 hrs.                                                Max. Marks: 100

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

### Module-1

1  a. Define statically determinate and indeterminate structures. **(05 Marks)**
   b. Explain degree of freedom with example **(05 Marks)**
   c. Determine the Reactions 'RA' and 'RB' by using influence line diagram for beam loaded as shown in Fig Q1(c).
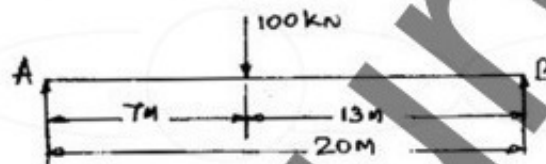


Fig Q1(c)                                                    **(10 Marks)**

### OR

2  a. Determine the 'static' and 'kinematic' indeterminacy for the structures shown in Fig Q2(a) – (i), (ii), (iii)



Fig Q2(a) – (i)          Fig Q2(a) – (ii)          Fig Q2(a) – (iii)
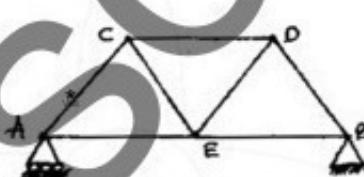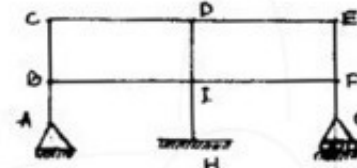                                                            **(06 Marks)**

   b. A point load of 8kN crosses a girder of span 15m from left to right as shown in Fig Q2(b). Calculate: i) Maximum Reaction  ii) SF and BM at a section 6m from left.
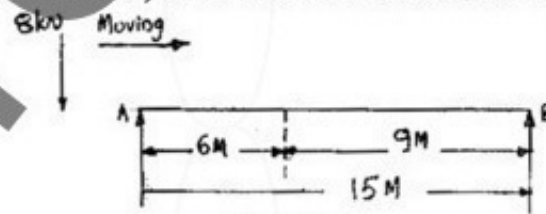


Fig Q2(b)                                                    **(14 Marks)**

### Module-2

3  a. A simply supported beam of span 8m as shown in Fig Q3(a). Find the shear force and Bending moment at section 4m from left and draw ILD for support Reaction, SF and BM.
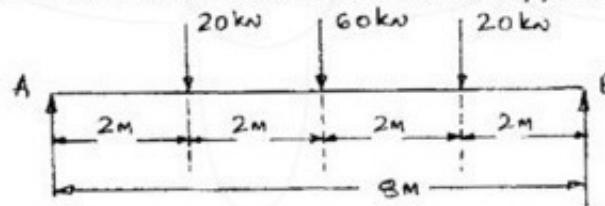


Fig Q3(a)                                                    **(10 Marks)**

**18CV42**

b. In a simply supported girder 'AB' of span 20m, determine the maximum bending moment and maximum shear force at a section 5m from A, due to the passage of a UDL of intensity 40kN/m, Longer than the span. **(10 Marks)**

**OR**

4 a. A system of 5 wheel loads 80kN, 140kN, 160kN, 50kN, and 40kN crosses the beam of 15m span as shown in Fig Q4(a), with 80kN load leading. The distance between the loads are 2.4m, 3m, 2.4m and 1.6m respectively. Find absolute BM.
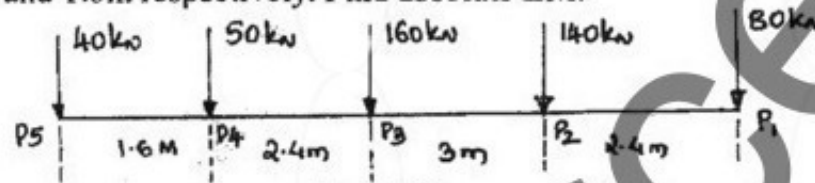


Fig Q4(a)                  **(10 Marks)**

b. Draw influence line diagram in members P, Q, R of the truss shown in Fig Q4(b),
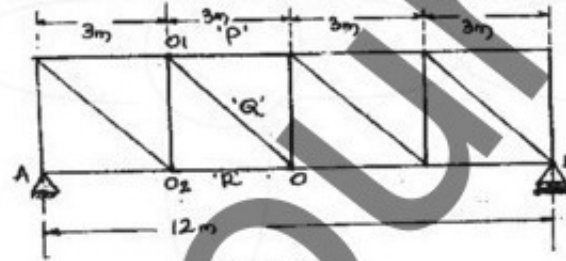


Fig Q4(b)                  **(10 Marks)**

**Module-3**

5 a. Find the slope and deflection at the free end of cantilever beam as shown in Fig Q5(a), by moment area method.
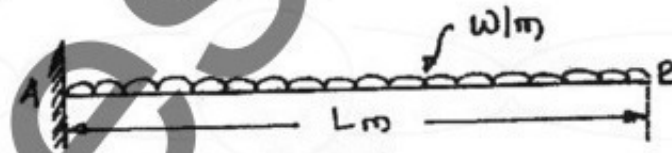


Fig Q5(a)                  **(10 Marks)**

b. Find the slope at the support and deflection under the point load, as shown in Fig Q5(b) by using conjugate beam method.
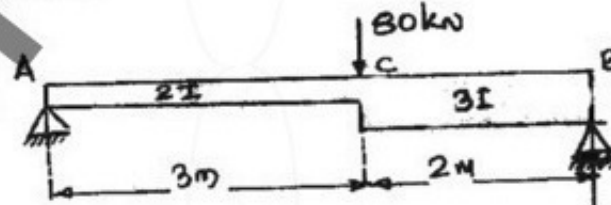


Fig Q5(b)                  **(10 Marks)**

**OR**

6 a. Calculate the slope and deflection at the free end of cantilever beam as shown in Fig Q6(a) by moment area method. Take EI = 4000 kN-m$^2$.
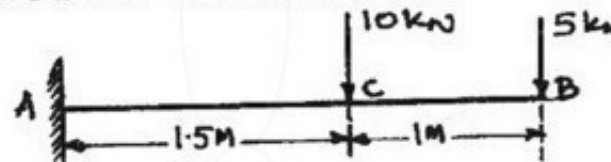


Fig Q6(a)                  **(10 Marks)**

2 of 4

18CV42

b. Determine the slope and deflection of the loaded cantilever beam shown in Fig Q6(b) at free end. Using conjugate beam method EI is constant.
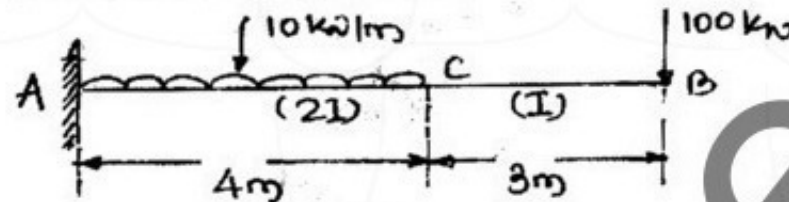


Fig Q6(b)                                                    (10 Marks)

## Module-4

7  a. Derive the expression for strain energy stored in a member due to bending.    (08 Marks)
   b. Find the deflection under concentrated load for the beam shown in Fig Q7(b). Using Castigliano's theorem. Take $E = 2 \times 10^8$ kN/m$^2$ and $I = 14 \times 10^{-6}$ m$^4$.
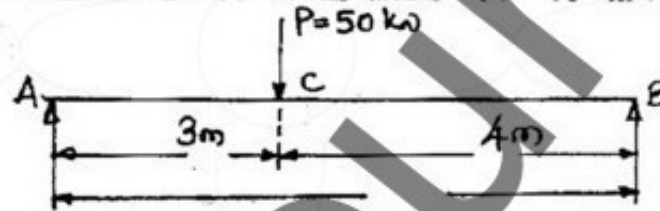


Fig Q7(b)                                                    (12 Marks)

OR

8  a. Determine the vertical deflection at joint 'C'. The cross sectional area of each member of the truss shown in Fig Q8(a), Take E = 200GPa, by unit load method.



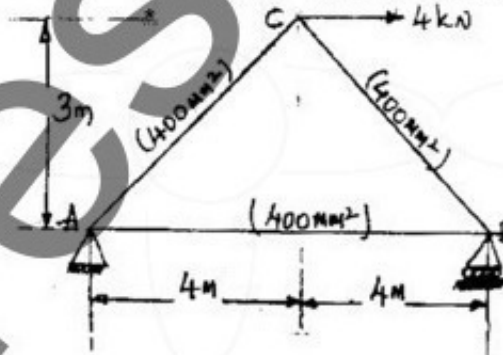Fig Q8(a)                                                    (10 Marks)

   b. Determine the vertical deflection at 'C' in the frame shown in Fig Q8(b). Take $E = 200 \times 10^6 \dfrac{kN}{m^2}$ and $I = 3 \times 10^7$ mm$^4$. Using strain energy method.
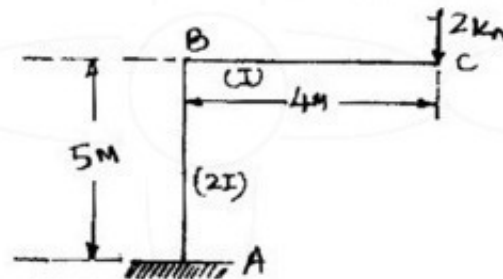


Fig Q8(b)                                                    (10 Marks)

3 of 4

## Module-5

9  a. A three hinged symmetrical parabolic arch of 20m span and rise of 5m, carries a UDL of 40kN/m on the entire span and a point load of 200kW at 5m from right end. Determine the Reactions, also determine BM ; Normal thrust and radial shear at 5m from left and support. **(12 Marks)**

   b. A cable is suspended between two points 'A' and 'B' 100m apart and a central dip of 8m of carries UDL of $20 \dfrac{kN}{M}$

   Find :  i) Maximum and minimum tension in the cable
   ii) Length of the cable. **(08 Marks)**

**OR**

10  a. Determine the bending moment, Normal thrust and radial shear at a section 6m from the left support for a three hinged parabolic arch as shown in Fig Q10(a).
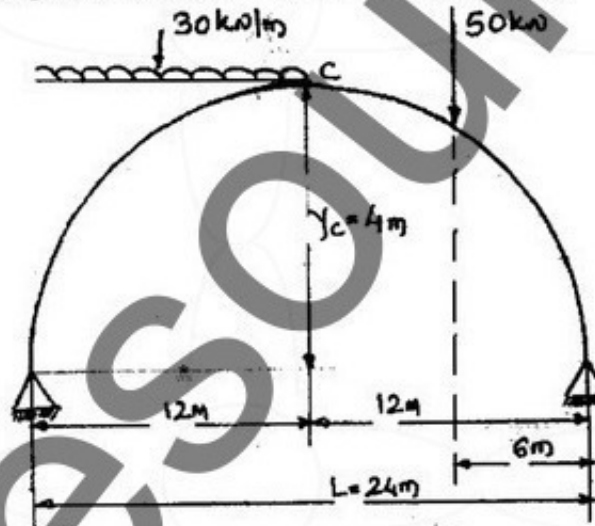


Fig Q10(a)          **(10 Marks)**

   b. A cable of span 20m and dip of 4m carries a UDL of 20kN/m over the whole span. Find :
   i)      Maximum tension in the cable
   ii)     Minimum tension in the cable
   iii)    Length of the cable          **(10 Marks)**

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