QPC: RJ19BTECH155 AR 19 Reg. No

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fourth Semester – Regular) Examinations, June – 2021

BPCCE4030 – STRUCTURAL ANALYSIS – I

(Civil Engineering)

Time: 2 hrs Maximum: 50 Marks

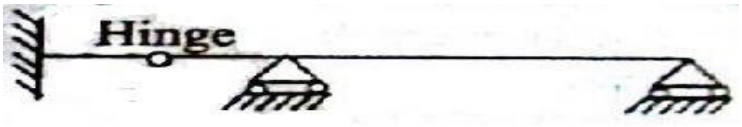
Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) **(1 x 10 = 10 Marks)**

Q.1. Answer ***ALL*** questions [CO#] [PO#]

a. The degree of indeterminacy of the beam given below is

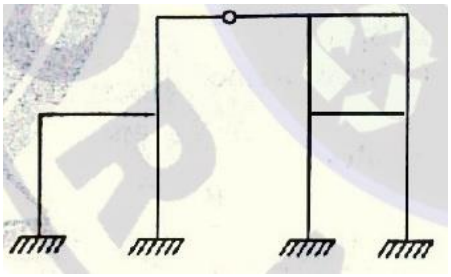


[CO1] [PO1]

(i) zero (ii) one

(iii) two (iv) three

b. What is the statical indeterminacy for the frame shown:

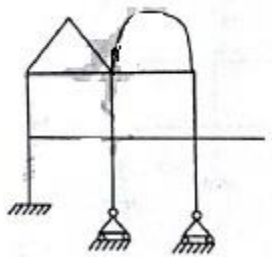


[CO1] [PO2]

(i) 12 (ii) 15

(iii) 11 (iv) 14

c. Determine the kinematic indeterminacies of the following frames (considering / neglecting axial deformations respectively)



[CO1] [PO3]

(i) 17 or 14 (ii) 28 or 14

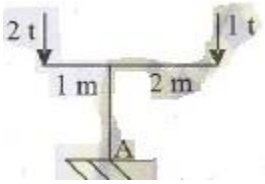
(iii) 7 or 4 (iv) 17 or 21

d. A three hinged symmetrical parabolic arch is subjected to a U.D.L w/unit over the entire span. The B.M at quarter span is [CO1] [PO1]

(i) zero (ii) $wl^2/8$

(iii) $wl^2/12$ (iv) $wl^2/24$

e. The B.M. at 'A' of structure shown aside is



[CO1] [PO1]

(i) 4 t.m (ii) 2 t.m

(iii) 3 t.m (iv) zero

f. A suspension cable is supported at two point "A" and "B". "A" being one metre above "B". The distance AB being 20m. The cable is subjected to 4 loads of 3kN, 5kN, 6kN and 4kN at distances 4m, 8m, 12m and 16m respectively from "A". Find the maximum tension in the cable. If the dip of the cable at point of application of first load is 1m with respect to level at A. [CO1] [PO2]

(i) 33.35 (ii) 51.24

(iii) 23.67 (iv) 44.32

g. The deflection of the free end of a cantilever subjected to a couple M at its free end and having a uniform flexural rigidity EI throughout its length 'L' is equal to [CO2] [PO1]

(i) $ML^2/2EI$ (ii) $ML^2/3EI$

(iii) $ML^2/6EI$ (iv) $ML^2/8EI$

h. The strain energy in a member [CO2] [PO1]

(i) directly proportional to strains (ii) directly proportional to changes in strain

(iii) a function of strains as well as stresses (iv) a function of loads only

i. The principle of virtual work can be applied to elastic system by considering the virtual work of _____ ? [CO2] [PO1]

(i) internal forces only (ii) external forces only

(iii) internal as well as external forces (iv) none of the above

j. A cable of span 140m and dip 14m is subjected to a rise in temperature of 28° C. If the coefficient of thermal expansion of the cable material is 4×10-6 /°C, What are the changes in the horizontal tension, if the cable carries a load of 15kN/m? [CO1] [PO2]

(i) 3.456 kN (ii) 5.513 kN

(iii) 2.625 kN (iv) 1.654 kN

PART – B: (Short Answer Questions) (2 x 5 = 10 Marks)

Q.2. Answer ***ALL*** questions [CO#] [PO#]

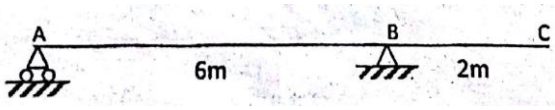
a. Differentiate static and kinematic indeterminacy of structure? [CO1] [PO1]

b. State Eddy's theorem as applicable to arches? [CO1] [PO2]

c. When do you prefer Moment area method? [CO2] [PO1]

d. Write down the expressions for radial shear and normal thrust in a three hinged parabolic arch? [CO2] [PO1]

e. Draw the influence line for shear to the left of B for the overhanging beam shown below. [CO1] [PO2]

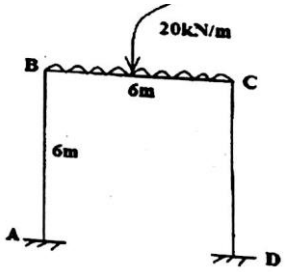


PART – C: (Long Answer Questions) (6 x 5 = 30 Marks)

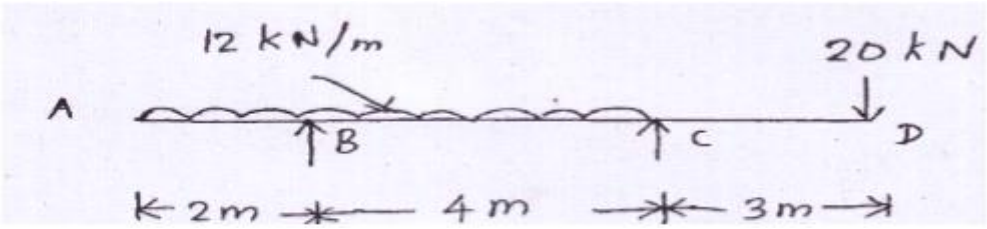
Answer ***ALL*** questions Marks [CO#] [PO#]

3. A two span continuous beam ABC fixed A and supported B and C. AB=7m and BC=4m. Moment of inertia is constant throughout. A single non concentrated central load of 12 kN acts at 3m from A and a single concentrated central load of 11 kN act on BC. Analyze the beam by force method and draw the BMD and SF. (6) [CO1] [PO2]

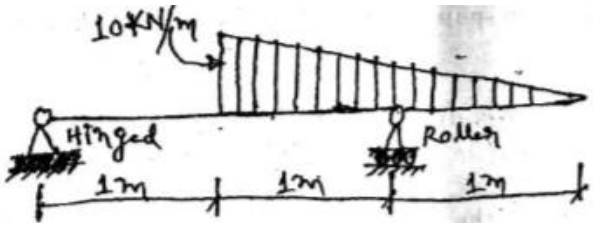
4. Analyze the portal frame shown in fig: by force method and draw the bending moment diagram. (6) [CO1] [PO2]



5. Draw shear force and bending moment diagram for the beam given in Fig. (6) CO3 PO2



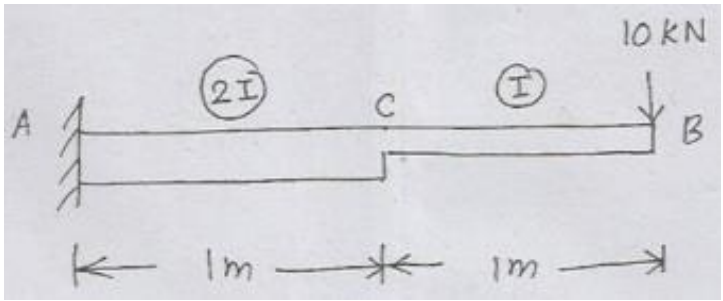
6. Analyze the beam shown in fig and draw the BMD indicating the salient points in it. (6) [CO2] [PO2]



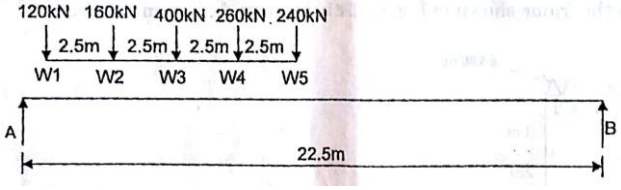
7. A suspension cable is supported at two point "A" and "B". "A" being one metre above "B". The distance AB being 20m. The cable is subjected to 4 loads of 2kN, 4kN, 5kN and 3kN at distances 4m, 8m, 12m and 16m respectively from "A". Find the maximum tension in the cable. If the dip of the cable at point of application of first load is 1m with respect to level at A. Find also the length of the cable. (6) [CO2] [PO2]

8. A beam simply supported over a span of 3m carries a UDL of 20 kN/m over the entire span. The flexural rigidity EI = 2.25 MNm^2. Using Castigliano's theorem, determine the deflection at the centre of the beam and also find the slope at ends. (6) [CO2] [PO2]

9. Using conjugate beam method finds the mid span deflection of the beam shown in fig: E= $200x10^6 kN/m^2$ and I =$200x\ 10^{-4}\ m^4$. (6) [CO2] [PO2]



10. A train of 5 wheel loads crosses a simply supported beam of 22.5m. Using influence lines calculate the maximum positive and negative shear forces at mid span. And absolute maximum bending moment anywhere in the beam. (6) [CO1] [PO2]



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