(3 Hours) Maximum Marks: 80

N.B. (1) Question **No 1** is compulsory. Attempt any **three** out of remaining five questions.

(2) Draw **neat Sketches** wherever required.

(3) **Assume suitable data** wherever required and state it clearly

(4) **Figures to right** indicate full marks

Q 1 . Attempt any **Four** questions

(a). State and Explain Castiglianos first theorem and principal of superposition **05**

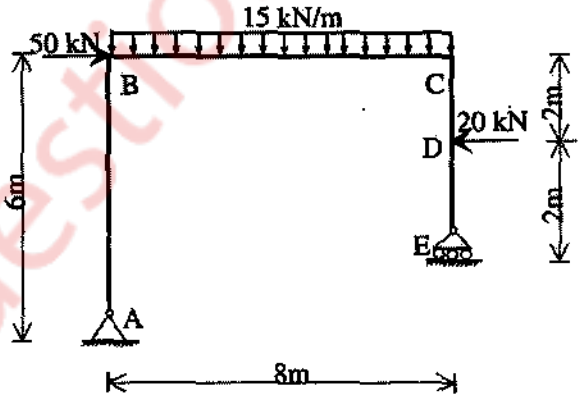
(b). Explain the two moment area theorems with necessary diagrams **05**

(c). For a Three Hinged parabolic arch of span L/ and rise h carries a udl of intensity w per unit run over the whole span. Show that horizontal thrust at each support of arch is $wl^2/8$ and bending moment at any section of the arch is zero. **05**

(d). Explain the application of virtual work method for finding deflection in Trusses **05**

(e). Explain the function of each components of a suspension bridge consisting of suspension cable and three hinged stiffening girder **05**

Q2 (a) For the plane frame as shown in the figure draw free body diagrams of each member and construct AFD ,SFD and BMD. **14**



(b) Explain ILD and state its importance; and draw ILD for reactions ,Shear force and bending moment for a simply supported beam **06**

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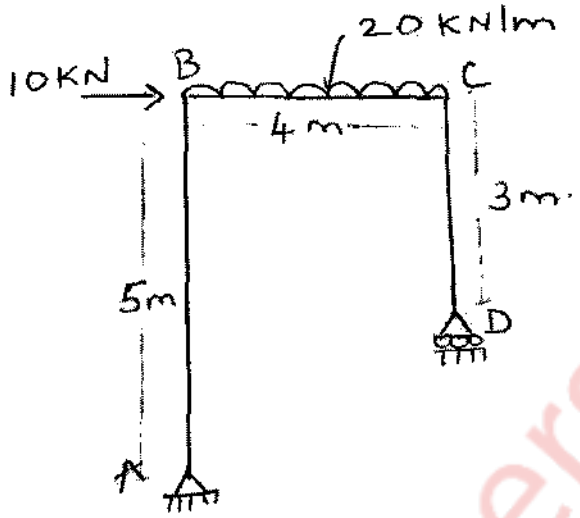
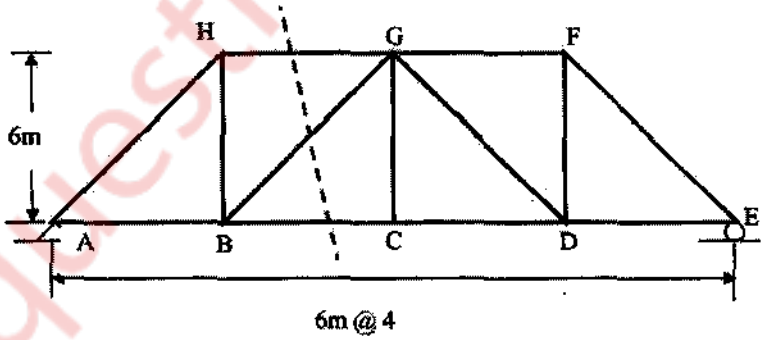
Q3 (a) Using unit load method or castigliano's second theorem for the rigid jointed frame as shown in the figure, calculate horizontal displacement of roller support D .Take E =200GPa and I=3 x 10^8 mm^4 **10**



(b) A suspension bridge 120m span has three hinged stiffening girder supported by two cables having a central dip of 12m .The roadway has width of 6m .The dead load on the bridge is 5KN/m^2 while live load is 10 KN/m^2which act on left half of the span .Determine shear force and bending moment in girder at 30 m from the left end. Also find maximum and minimum tension in cable for the position of live load. **10**

Q4 (a) Draw ILD for members HG, BG of the truss as shown in the figure .Assume that load is moving along bottom chord. **10**



(b) A beam of T-section ; (flange 60mm x 10mm, web 100mm x 5mm) is 3m long and is simply supported at the ends .It carries a load of 4KN inclined at 20 degrees to the vertical and passing through centroid of the section . E = 200 GN/m^2 ; Locate Neutral axis and find maximum and minimum compressive and tensile stress produced at critical section. **10**

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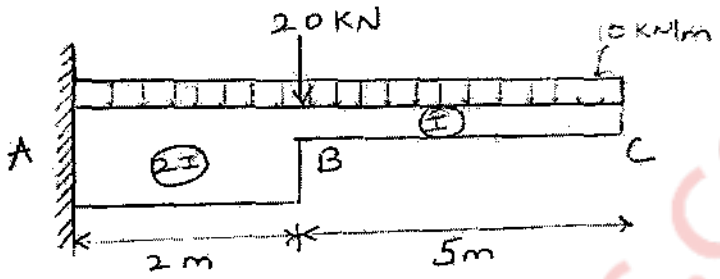
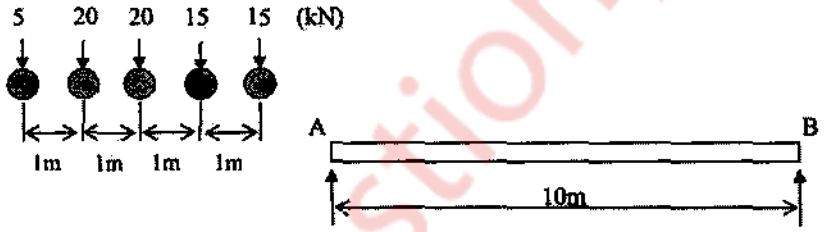
Q5 (a) Determine the slope and deflection at point C of the beam as shown in the figure using moment area OR conjugate beam method .E= 200GPa ; I= 250 x 10^6 mm^4 AB=2m; BC = 5m UDL = 10KN/m (entire span); Point load =20KN at B **10**



(b) A column 4m long of circular section made of cast iron with 200mm external diameter and 20mm thick is used as column .Both ends are fixed .The column carries a load of 150KN at an eccentricity of 25mm from the axis of the column. Find extreme stress on the column section. Take E= 9.4 x 10^4 MPa **10**

Q6(a) Explain concept of shear centre and Unsymmetrical Bending **04**

(b) Determine the absolute Bending Moment in a simply supported beam (girder) .The loads are moving from left to right on the girder. Support A is roller and support B is a hinge . **08**



08

(c) A three hinged parabolic arch has a span of 20 m .It carries a UDL of 10 kN/m over entire span and two point load of 40 KN each at 2m and 5m from left support. Compute reactions .Also find BM, radial shear and normal thrust at a section 4m from left end ; take central rise as 4m.

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