(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2133 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. V) THEORY EXAMINATION 2011-12

STRUCTURAL ANALYSIS – 2

Time : 3 Hours *Total Marks : 100*

Note :– Attempt **all** questions. Any missing data may suitably be assumed. Numerical accuracy is as important as procedure.

1. Attempt any **four** of the following : **(5×4=20)**

   (a) Write down the assumptions made in the analysis of pin jointed trusses and explain with examples how do you calculate the degrees of static and kinematic indeterminacy of such trusses ?

   (b) Write the all slope deflection equations for the portal frame shown in the Fig. 1 below :

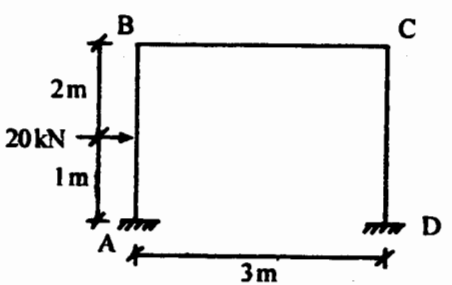

Figure 1

(c) A beam ABC is fixed at 'A' and supported at 'B' and 'C' respectively as shown in Fig. 2. Find the distribution factors at joint B, if no moment is to be transferred at 'C'.

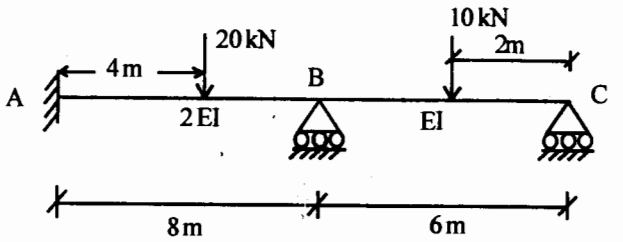

Figure 2

(d) Discuss the situations with the help of neat diagrams where in Sway will occur in portal frames.

(e) Analyse the two span continuous beam shown in Figure 3 by moment distribution method and draw the free body diagram :

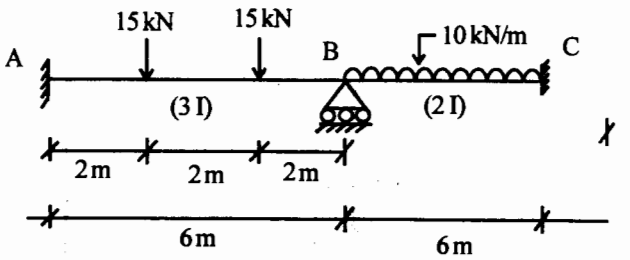

Figure-3

(f) Using slope deflection equations explain what are the effects of support settlements on the indeterminate structures. Use neat diagrams to explain your point.

2. Attempt any **two** of the following : **(10×2=20)**

(a) Determine and draw the influence line for the reaction at the middle support 'B' of continuous beam shown in Figure-4 and compute the ordinates at every 2 m intervals :

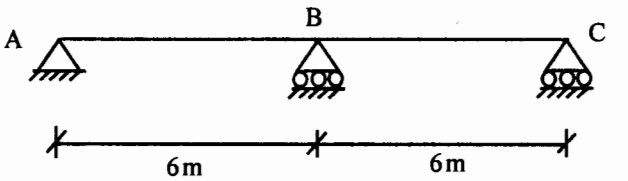

Figure-4

(b) Derive an expression and show that the horizontal reaction 'H' in a two hinged arch is calculated as $H = \dfrac{\int_0^{\ell} \mu \cdot y \, dx}{\int_0^{\ell} y^2 \, dx}$

where ℓ = span of the arch and $I = I_0 \sec \theta$, I_0 = MI at crown.

(c) Find the horizontal thrust in a two hinged parabolic arch of rise 10 m and span 60 m subjected to an udl of 25 kN/m. The moment of inertia at crown is 1.14×10^{-3} m^4 and the area of cross section is 6.75×10^{-2} m^2. Also calculate the bending moment at crown.

3. Attempt any **two** of the following : **(10×2=20)**

(a) A cable of uniform cross sectional area is stretched between two supports 100 m apart with one end 4 m above the other end as shown in Fig. 5. The cable is loaded with a udl of 10 kN/m and the sag of cable measured from higher end is 6 m. Find the horizontal tension in the cable. Also find the maximum tension in the cable :

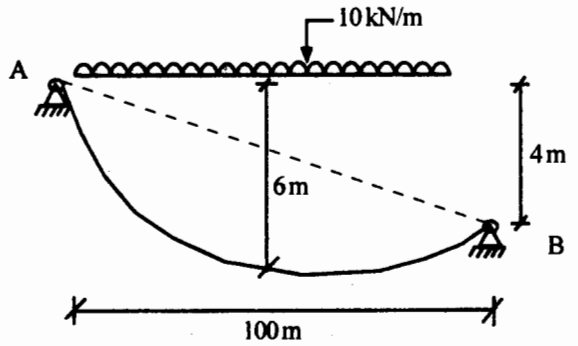

Figure-5

(b) A suspension bridge with a parabolic cable of span 100 m and a dip of 15 m is stiffened by a three hinged stiffening girder to restraint the cable to maintain a parabolic shape. The stiffening girder carries two concentrated loads 20 kN each placed at 15 m and 30 m from left hinge. Evaluate the bending moment and shear force in the girder at section 40 m from left hinge. Also determine the maximum tension in the cable.

(c) A suspension bridge 150 m span has a dip of 20 m. It carries a udl of 50 kN/m. Calculate the forces on the supporting piers :

(i) when the cable is run over a pulley device.

(ii) when cables are attached to a saddle resting on rollers at the top of the pier.

The anchor cable makes an angle of 45° with the piers.

4. Attempt any **one** of the following : **(20×1=20)**

(a) Analyse the continuous beam shown in the figure-6 using matrix method, and find moments and reactions :

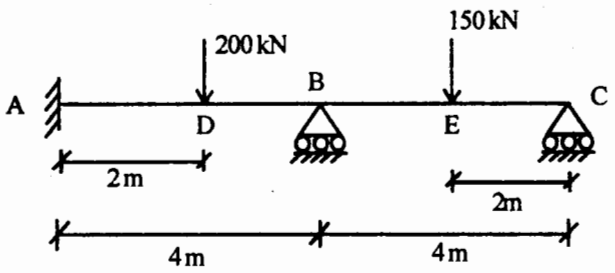

Figure 6

(b) Determine the redundants in the frame shown in Figure 7 by stiffness method :

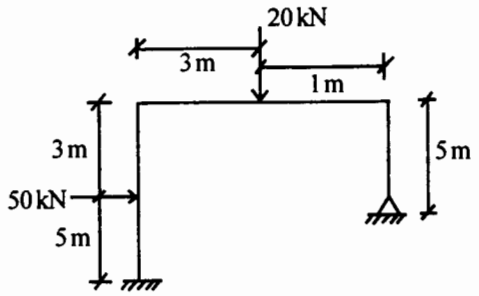

Figure-7

5. Attempt any **two** of the following : **(10×2=20)**

(a) (i) Differentiate between plastic modulas and section modulas.

(ii) State and explain the upper bound and lower bound theorems for collapse load.

(iii) Define load factor of a structure and distinguish between factor of safety and load factor.

(iv) What are the assumptions made in analysis of structures by plastic theory ?

(b) A portal frame shown in Figure-8 is loaded up to collapse. Determine the plastic moment of resistance required if the section is uniform throughout.

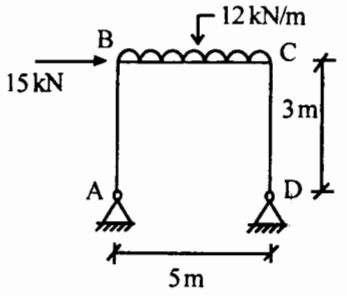

Figure-8

(c) Find the shape factor for a hollow circular section with inner diameter 'd' and outer diameter 'D'.