53 (CE 801) DGST

2018

DESIGN OF STRUCTURE–III

Paper : CE 801

Full Marks : 100

Time : Four hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. (a) Bring out the differences between working stress and limit state method of design. 6

   (b) Analyze the beam shown in *Fig. 1* and draw the bending moment and shear force diagram. 14
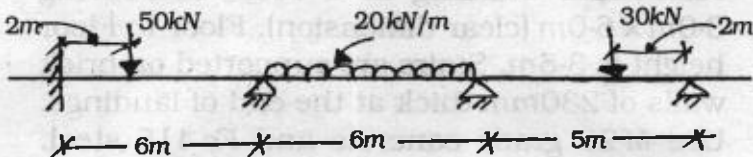

Fig. 1

2. (a) Analyze the frame shown in *Fig.* 2 by portal method and draw the bending moment and shear force diagram.
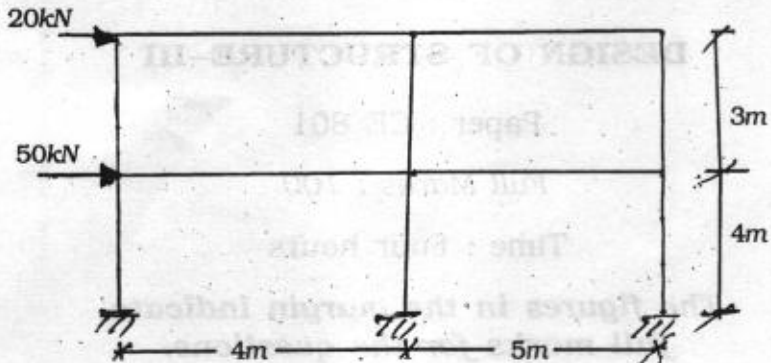
14

Fig. 2

(b) What are the assumptions made in portal method of analysis and in cantilever method of analysis ?

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3. Design a dog legged stair case for a residential building in a room measuring $3.0m \times 6.0m$ (clear dimension). Floor to Floor height is $3.5m$. Stairs are supported on brick walls of $230mm$ thick at the end of landings. Use $M20$ grade concrete and $Fe\,415$ steel. And show the reinforcement details in the stair.

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4. *(a)* What are the advantages and disadvantages of prestressed concrete ? 5

(b) A prestressed concrete beam of rectangular section 300*mm* wide and 550*mm* deep has a span of 10*m*, the effective prestressing force is 920*kN*; at an eccentricity of 110*m*. The dead load of the beam is 4·5*kN/m* and the beam has to carry a live load of 7·5*kN/m*. Find the extreme stresses :

    (a)   at the end of the section

    (b)   at midspan without the action of live load

    (c)   at midsection with the action of live load. 15

5. *(a)* Explain loss due to elastic deformation in prestressed concrete. 5

(b) A prestressed beam 300*mm* wide and 350*mm* deep to be prestressed by 12 wires, each 7*mm* diameter initially stressed to 1500*MPa* with their centroid located 120*mm* above the sofit of the beam. Estimate the final % loss of stress due to elastic deformation, creep, shrinkage and relaxation. Take $E_s = 2100 kN/m^2$,

$E_c = 35 kN/m^2$, $\phi = 1·60$, $\epsilon_r = 3 \times 10^{-4}$.

15

6. Design a rectangular water tank resting on ground for a capacity of 75000 litres. The materials are $M\,30$ grade concrete and HYSD reinforcement of grade 415.   20

7. Design the principal rafter of a fink type roof truss for the following data. Design also its connection using $20\,mm$ diameter bolts.

Design compressive load	$165kN$
Design tensile load	$60kN$
Length of rafter panel	$2\cdot235m$
Grade of steel	$Fe\,415$
Grade of bolt	$4\cdot6$

    20