53 (CE-801) DGST

2019

DESIGN OF STRUCTURES-III

Paper : CE 801

Full Marks : 100

Time : Three hours

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

Answer ***any five*** *questions.*

1. *(a)* Define Pre-stressed concrete and discuss the advantages & disadvantages of Pre-stressed concrete. 6

Contd.

(b) A pre-stressed concrete beam of rectangular section $300mm$ wide, $600mm$ deep has a span of $10m$. The effective pre-stressing force is $1500kN$ at an eccentricity of $70mm$. The dead load of beam is $7kN/m$ and the beam has to carry a live load of $12kN/m$. Determine the extreme stresses in concrete—

(i) at mid-section without the action of live load

(ii) at mid-section with the action of live load

(iii) at end-section with the action of dead load. 14

2. (a) List out the various losses in pre-stressed concrete and explain *any one* in detail. 6

(b) A pre-tensioned beam $300mm$ wide and $350mm$ deep is pre-stressed by 15 number of wires of $6mm$ dia, initially stressed to $1200N/mm^2$ with their centroid locator at $100mm$ from the soffit. Calculate the final % of loss of stress due to elastic deformation, creep, shrinkage and relaxation of steel with the following

data :

Creep coefficient $(\phi) = 1.6$ Residual shrinkage strain $= 3 \times 10^{-4}$

$E_s = 210kN/m^2$,

$E_c = 35kN/m^2$ 14

3. Design a dog-legged stai for an office building for the following data. Floor height $= 3.2m$, width of flight $= 1.2m$, live load $= 4kN/m^2$. Floor finish $= 1.0kN/m^2$.

Assume the stair to be supported on $230mm$ thick masonry walls at the outer edges of the landing parallel to the risers. Use M25 concrete and *Fe* 500 steel. Assume mild exposure condition. 20

4. Analyze the frame shown in *fig*-1 by cantilever method. Also draw the B.M.D. & S.F.D. 20

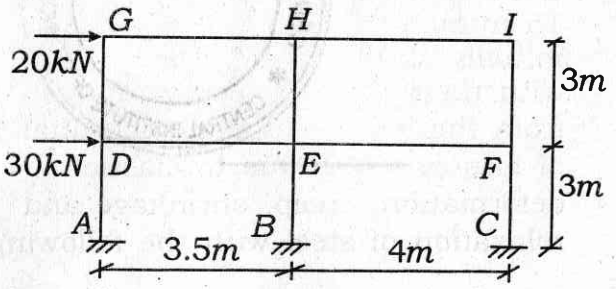

fig – 1

5. Design a rectangular water tank resting on ground for a capacity of 75000 litres. Use M30 concrete and Fe 500 steel. 20

6. Design a foot-bridge for the following data : 20

   (a) Span of girder 12*m c/c*

   (b) Cross girder spacing 2.5*m c/c*

   (c) Clear working width between main girder 3.0*m*

   (d) Live load 5.0kN/m^2

   (e) Flooring — timber plank

   Assume any missing data.