1873

Analysis & Design of Special Structures
(Old) (1080)

P. Pages : 3

Time : Four Hours

Max. Marks : 100

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any one** question from each unit.
5. Use of IS800, IS456, IS1343, IS875 & steel table is allowed.
6. Assume suitable data if necessary & mention it clearly.
7. Use of non-programmable calculator is allowed.
8. Figures to the right indicate full marks.

UNIT - I

1. a) State various advantages of pre stressed concrete structures over R.C.C. structures. **5**

   b) States systems of prestressing & explain any one in brief. **5**

   c) A concrete beam of symmetrical I-section spanning 8 m has flange width and thickness of 200 mm & 80 mm respectively. The overall depth of the beam is 400mm. The thickness of the web is 80mm. The beam is prestressed by a parabolic cable with an eccentricity of 15mm at the centre and zero at the supports, with an effective prestressing force of 200 kN. The live load on the beam is 2 kN/m.
   Calculate the extreme fibre stress intensity at mid-span section. **15**

2. a) Explain various profile of tendons. **5**

   b) How, initial compressive stresses are transferred to the concrete for pre-tensioned & post-tensioned members. **5**

   c) A pre-tensioned beam 250mm wide & 300mm deep is prestressed by 12 wires each of 7mm diameter, initially stressed to 1200 N/mm^2 with their centroid located 100mm from bottom.
   Estimate the final percentage loss of stress due to elastic deformation,

creep, shrinkage and relaxation using IS1343 and the following data.

Relaxation of steel stress = 90 N/mm^2

Mod. of elasticity for steel = 200 kN/mm^2

Mod. of elasticity for concrete = 35 kN/mm^2

Creep coefficient = 1.6

Residual shrinkage strain = 300×10^{-6}.   **15**

UNIT - II

3.   a)   Explain in brief Guyon's method for anchorage zone stresses in end block.   **9**

     b)   Plot stress distribution in end block for single anchor plate & for double anchor plate in post-tensioned members.   **9**

     c)   Explain with the help of stress diagram the upper & lower kern points.   **7**

4.   Design a post-tensioned prestressed concrete beam for the following data.   **25**
(Design for flexure & shear only)
   i)   Effective span = 20 m
   ii)   Live load = 14 kN/m
   iii)   Loss ratio = 0.85
   iv)   Use M - 40 grade concrete & 12/7 wires of freyssinet system of ultimate stress 1600 MPa.
   v)   Assume allowable stresses as per IS-1343.

UNIT - III

5.   Design a gantry girder to be used in an industrial building carrying an electrically operated travelling crane, for the following data

Crane capacity	=	200 kN
Self weight of crane girder excluding trolley	=	200 kN
Self weight of the trolley, electric motor, hook etc	=	40 kN
Approximate minimum approach of the crane hook to the gantry girder	=	1.2 m
Wheel base of crane	=	3.5 m
C/c distance between gantry rails	=	14 m
C/c distance between columns (span of gantry girder)	=	8 m
Self weight of rail section	=	300 N/m
Yield stress of steel	=	250 N/mm^2

   25

6.   Design an elevated pressed steel tank, rectangular in shape for a capacity of 100,000 litres. Height of staging is 12 m.

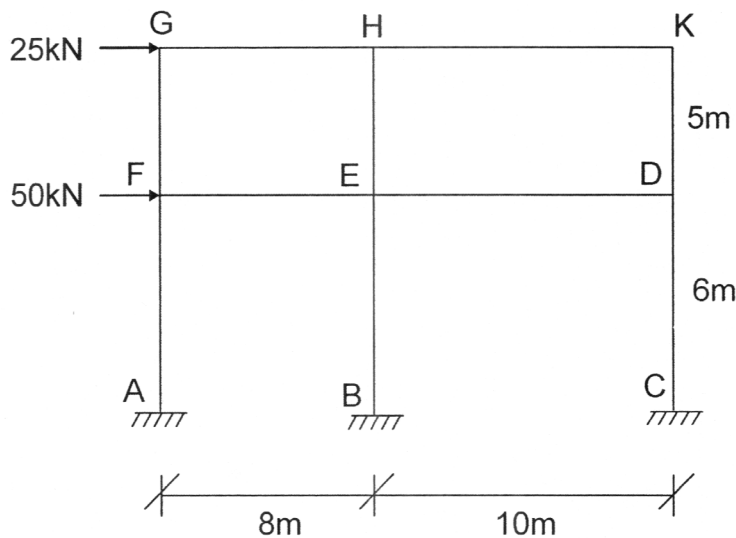Take $f_y = 250 \text{N}/\text{mm}^2$.

Square steel plates of size 1.5m are available.
(Design of staging is not required)   **25**

UNIT - IV

7.   a)   Explain in brief substitute frame method of analysis of multi-storeyed frames.   **5**

      b)   Analyse the given frame by portal method. Also plot its bending moment diagram.   **20**

8.   Design an interior panel of a flat slab with 4.5m x 6m panel. The columns are of square c/s of side 500mm.

      No column head or drop is provided. The total load on slab including dead load may be taken as 12 kN/m².

      Use M-20 grade concrete & Fe-415 grade steel. Show detailing of reinforcement neatly.   **25**

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