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

P. Pages : 4

Time : Four Hours **Max. Marks : 100**

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answer sheet 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 IS 456, IS 800, IS 875, IS 1343 & steel table is allowed.
6. Use of non-programmable calculator is allowed.
7. Assume suitable data if necessary & mention it clearly.
8. Figures to the right indicate full marks.

UNIT – I

1. a) What are the necessities of using high strength concrete and high tensile steel in pre-stressed concrete. **5**

b) What are the factors influencing the creep and shrinkage of concrete. **5**

c) A pre-stressed concrete beam supports a live load of 4 kN/m over a simply supported span of 8m. The beam has an I-section with an overall depth of 400 mm. The thickness of flange is 60mm & that of web is 80 mm. The width of flange is 200mm. The beam is to be pre-stressed by an effective pre-stressing force of 235 kN at a suitable eccentricity such that the resultant stress at the soffit of the beam at the center of span is zero. **15**

Determine the eccentricity required for the force.

2. a) Explain any one post-tensioning system based on wedge action with sketch. **5**

b) Explain the concept of load balancing in pre-stressed concrete members. **5**

c) A post-tensioned concrete beam, 100mm wide and 300mm deep is pre-stressed by three cables, each with a c/s area of 50mm^2 and with an initial stress of 1200 N/mm^2. All the three cables are straight and located 100mm from the soffit of the beam. If the modular ratio is 6, calculate the loss of stress in three cables due to elastic deformation of concrete for following cases : **15**

i) Simultaneous tensioning and anchoring of all the three cables; and

ii) Successive tensioning of the three cables, one at a time.

UNIT – II

3. a) Briefly explain the mechanism by which pre-stressing force is transferred to concrete in pre-tensioned members. **5**

b) What is transmission length ? List the various factors influencing transmission length. **5**

c) Explain the terms end block and anchorage zone with reference to post-tensioned pre-stressed members. **5**

d) How do you compute the bursting tension is an end block, subjected to evenly distributed forces using Guyon's method. **5**

e) How do you select the preliminary dimensions of post tensioned beam having an unsymmetrical I-section. **5**

4. a) Explain lower kern point and upper kern point. **5**

b) Design a post-tensioned pre-stressed concrete beam for flexure only, using following data : **20**

Effective span = 24m
Live load = 20 kN/m
Loss ratio = 0.85
Use M-40 concrete grade and 12/7 wires of Freyssinet system of ultimate stress 1600 MPa.

UNIT – III

5. Design a gantry girder to be used in an industrial building carrying an electric operated travelling crane, for the following data : (Design of connection is not required) **25**

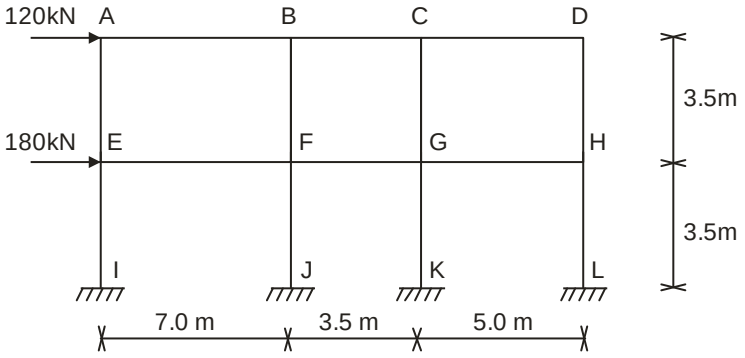
Crane capacity	= 200 kN
Self wt. of crane girder excluding trolley	= 200 kN
Self wt. of the trolley, electric motor, hook etc.	= 40 kN
Approximate minimum approach of the crane hook to the gantry girder	= 1.20 m
Wheel base of crane	= 3.5 m
C/C distance between gantry rails	= 16 m
C/C distance between columns (span of gantry girder)	= 8 m
Self wt. of rail section	= 300 N/m
Yield stress of steel	= 250 N/mm^2.

6. Design a pressed steel tank (elevated) square in shape, for a capacity of 85,000 liters. **25**
Height of tank container = 2.5m
Size of pressed plates = 1.25m x 1.25m
Take yield stress of steel = 250 N/mm^2
Bottom of tank bearer above ground level = 9.0m
(Design of supporting tower is not required)

UNIT – IV

7. a) What are the assumptions made in the cantilever method of approximate analysis of building frames. **5**

b) Analyse the building frame, subjected to horizontal forces as sown in figure, by using portal method **20**



8. a) Write advantages & solutions, were flat slab construction is prefered. **5**

b) Design the interior panel of a flat slab for 6.0m x 6.0 m panel size. Take super-imposed live load of 5 kN/m^2 and column size as 400mm in diameter. Use M-20 grade concrete and Fe-415 HYSD bars. **20**

Also sketch the reinforcement details.

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