Enrollment No......................................

Faculty of Engineering
End Sem (Even) Examination May-2022
CE5EL02 Pre-Stressed Design of Concrete Structures
Programme: M.Tech.   Branch/Specialisation: CE

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1
i. Minimum grade of concrete used for pre tensioned concrete member **1**
(a) M-25   (b) M-30   (c) M-40   (d) M-35

ii. Shrinkage loss is not occurred in- **1**
(a) Post-tensioned system   (b) Pre-tensioned system
(c) Both (a) and (b)   (d) none of these

iii. In Magnel method of anchorage zone stress calculation end block considered as a- **1**
(a) Shallow Beam   (b) Deep Beam
(c) Long Beam   (d) Short Beam

iv. The minimum BM at a section due to- **1**
(a) Point Load   (b) Live Load
(c) Dead Load   (d) U D L

v. IS 1343-1980 prescribes a minimum longitudinal reinforcement in pre-stressed beam is- **1**
(a) 5%   (b) 4%   (c) 3%   (d) 2%

vi. In strain compatibility method the average stress for maximum strain in concrete is- **1**
(a) f_{uk} (b) f_u (c) f_y (d) $k_1 f_{ck}$

vii. The young's modulus of elasticity of high-tension steel wires in kN/mm^2 is- **1**
(a) 2   (b) 20   (c) 200   (d) 2000

viii. Cube strength of concrete always _____ than cube strength of transfer. **1**
(a) More   (b) Less   (c) Stronger   (d) Can't Say

ix. Relation between Flexural tensile strength of concrete and direct tensile strength while designing prestress water tank will be- **1**
(a) $f_{cr} = 3f_t$ (b) $f_{cr} = 2f_t$ (c) $f_{cr} = 0.5f_t$ (d) None of these

x. direct tensile strength of concrete while designing prestress water tank will be- **1**
    (a) $f_t=0.67 \sqrt{(f_{cu})}$ (b) $f_t=2.67 \sqrt{(f_{cu})}$
    (c) $f_t=0.267 \sqrt{(f_{cu})}$ (d) None of these

Q.2 i.   How many types of strain are possible in high strength concrete? Write the Name and describe any one of them. **2**

    ii.   Differentiate between Pre and Post tensioning. **3**

    iii.   Enlist the different method of post- tensioning explain any one in detail. **5**

OR iv.   Find the value of eccentricity in pre stress concrete to resist a load of 800 kN in a beam of c/s 300 * 550 and prestressed by a force of 250 kN . **5**

Q.3 i.   Define kern zone and kern points for prestress members. **3**

    ii.   If a beam of effective span 4.5 m and size 300 * 700 is subjected to a live lode of 10 kN/m, then find the suitable load combination as Per IS-code recommendations also find its kern zone for 200 kN of prestressing force. **7**

OR iii.   A Pretensioned prestressed concrete beam of dimension 300 mm wide 1000 mm deep and 10 m long is subjected to a prestressed force of 2000 KN at an eccentricity of 200 mm over the entire length. If 2000 mm^2 c/s area of steel through 5 mm wires are used for prestressing, find the losses due to- **7**
    (a) Elastic shortening   (b) Creep of concrete
    Take Es = 2 * 10^5 N/mm^2, Ec = 3 * 10^4 N/mm^2.

Q.4 i.   Write any three flexural failures. Describe any one in brief. **3**

    ii.   A pre-tensioned pre-stressed concrete beam having a rectangular section, 150 mm wide and 350 mm deep has an effective cover of 50 mm. If f_{ck} = 40 N/mm^2, f_p = 1600 N/mm^2, and the area of prestressing steel Ap = 461 mm^2. Calculate the ultimate flexural strength. **7**

OR iii.   Write assumption made in strain compatibility method for estimating flexural strength also draw the diagram for stress strain distribution at failure. **7**

Q.5 i.   Write the types of shear cracks in Prestressed concrete beams. **4**

    ii.   A prestressed girder of rectangular section 150 mm wide by 300 mm deep is to be designed to support an ultimate shear force of 130 kN. The uniform prestress across the section is 5 N/mm^2 given f_{ck} = 40 N/mm^2 and Fe-415 HYSD bars of 8 mm diameter. Design suitable spacing of stirrups confirming to IS:1343 recommendations. Assume cover to the reinforcement as 50 mm **6**

OR iii.   A prestressed concrete of span 10 m of rectangular c/s 120 mm wide and 300 mm deep is axially prestressed by a cable carrying an effective force 180 kN. The beam supports a total uniformly distributed load of 5 kN/m which includes the self weight of the member. Compare the magnitude of the principal tension development in the beam with and without the axial prestress. **6**

Q.6   Attempt any two:

    i.   Differentiate between circumferential prestressing and linear prestressing **5**

    ii.   Write the design procedure for design of circular water tank. **5**

    iii.   What do you mean by circumferential prestressing state the methods of wire widening in circumferential prestressing and the load resisting mechanism. **5**

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Scheme of Marking

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Pre-Stressed Design of Concrete Structures (T) - CE5EL02 (T)

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Note: The Paper Setter should provide the answer wise splitting of the marks in the scheme below.

Q.1	i)	(c) M-40	1
	ii)	(a) Post- tensioned system	1
	iii)	(b) Deep Beam	1
	iv)	c) Dead Load	1
	v)	(d)2%	1
	vi)	d) $k_1 f_{ck}$	1
	vii)	c) 200	1
	viii)	(a)More	1
	ix)	$f_{cr} = 2f_t$	1
	x)	$f_t = 0.267\sqrt{(f_{cu})}$	1
Q.2	i.	1 marks for 3 types and 1 marks for description	2
	ii.	3 marks for at least 4 differences	3
	iii.	2 marks for at least 3 names of method and 2 marks for explanation of one	5
OR	iv.	1 mark for data identification+ 1 marks for calculation section modulus + 2 marks for expression for resultant stress + 1 mark for final eccentricity	5
Q.3	i.	3 marks for definition with diagram	3
	ii.	3marks for load combination and 4 marks for kern zone description	7
OR	iii.	4 marks for loss due to creep 3 marks for loss due to elastic shortning	7
Q.4	i.		3

	ii.	1 marks for data identification 2 marks for expression and calculation of geometrical parameters+ 3 marks for final answer.	7
OR	iii.	4 marks for at least 5 proper assumption. 3 marks for stress and strain block diagram.	7
Q.5	i.	2 marks for each type and its description	4
	ii.	2 marks for data identification 2 marks for expression and code recommendation + 2 marks for final specing	6
OR	iii.	2 marks for data identification 2 marks for expression in extream fiber+ 2 marks for final comparision	6
Q.6			
	i.	5 marks for 5 differences	5
	ii.	3 marks for all steps 2 marks for IS-code provision	5
	iii.	2 marks for definition 3 marks for 2 method and their description.	5

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