KUMARAGURU
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Register Number:……..…

M.E DEGREE EXAMINATIONS: JUNE 2016

(Regulation 2015)

Second Semester

STRUCTURAL ENGINEERING

P15SETE15**:** Pre-Stressed Concrete

(IS codes: 1343,3370,784,3935 are permitted)

COURSE OUTCOMES

CO1: Design prestressed concrete structures for flexure and shear

CO2: Analyze and design of anchorage zone

CO3: Analyze intermediate prestressed concrete structure

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The ultimate tensile stress in the wire is ____N/mm^2. CO1 [K_1]

   a) 250 to 500 b) 750 to 1000

   c) 500 to 750 d) 1000 to 1500

2. In designing PSC flexural members, the breadth of compression flange is determined on the basis of _____. CO1 [K_1]

   a) Ultimate shear strength b) Ultimate tensile strength

   c) Ultimate flexural strength d) Ultimate bearing strength

3. Large magnitudes of torsion are better resisted by selecting beams of ____. CO3 [K_2]

   a) Rectangular section b) Hollow box-girder section

   c) I-section d) Square section

4. Match List I and List II CO2 [K_2]

List I Grade of In situ concrete	**List II** Allowable flexural tensile stress, N/mm^2
A. M25	i. 4.4
B. M30	ii. 3.6
C. M40	iii. 3.2

	D. M50			iv. 5.0

	A	B	C	D
a)	iii	i	ii	iv
b)	iii	ii	i	iv
c)	iii	iv	ii	i
d)	i	iii	iv	ii

5. As per IS code 3370 Part III, liquid retaining structures prescribes a least minimum load factor for collapse is ____. CO3 [K_1]

a) 1.25 b) 3.0

c) 2.0 d) 2.5

6. Loss of stress due to friction depend upon _____. CO1 [K_1]

a) Modulus of elasticity of concrete b) Relaxation of steel

c) Coefficient of friction d) Modulus of elasticity of steel

7. Assertion A: The Indian standard code IS: 678-1960, provides for a load factor of 2.5 for transverse bending strength. CO2 [K_1]

Reason R: The load factor required for strength and serviceability.

a) Both A and R are correct b) Only R is correct and A is incorrect

c) Only A is correct and R is incorrect d) Both A and R are incorrect

8. Prestressing a concrete beam with sloping or curved cables_____. CO3 [K_1]

a) Increase the shear strength b) decrease the shear strength

c) Increase the flexural strength d) decrease the flexural strength

9. (i) The main reinforcement in the anchorage zone should be designed to withstand the bursting tension, which is determined by the transverse stress distribution on the critical axis. CO2 [K_1]

(ii) Usually coinciding with the line of action of the largest individual force.

a) Both (i) & (ii) are true b) (i) true and (ii) false

c) Both (i) & (ii) are false d) (i) false and (ii) true

10. Composite construction using P.S.C and cast in situ concrete is adopted in CO3 [K_1]

a) Water tanks b) Bridges

c) Pipes d) Poles

PART B (10 x 2 = 20 Marks)

11. List the various types of tensioning devices used in prestressed concrete. CO1 [K_1]

12.	Explain why high strength concrete is used in prestressing.	CO1	[K_2]
13.	List the various methods of improving the shear resistance of structural concrete members by prestressing techniques.	CO1	[K_1]
14.	Discuss losses due to prestress and post tensioning.	CO1	[K_2]
15.	List the various advantages of continuous beam.	CO3	[K_1]
16.	Draw the typical tensile –stress distribution in an end block with single anchorage.	CO2	[K_4]
17.	Explain Guyon's theorem of Linear transformations.	CO2	[K_2]
18.	List the critical load conditions for design of poles.	CO3	[K_L]
19.	Discuss shapes of prestressed concrete tanks.	CO3	[K_2]
20.	Discuss why differential shrinkage occurs in composite constructions.	CO3	[K_2]

PART C (6 x 5 = 30 Marks)

21.	A prestressed beam 100x250mm is subjected to a live load of 2.5kN/m over a span of 6m. Find out the prestressing force required to nullify the stress (i) if it is concentrically applied (ii) if it is applied at an eccentricity of 40mm.	CO1	[K_4]
22.	A prestressed beam of 120x300mm spanning over 10m is axially prestressed by an effective force of 200kN. It supports an udl of 5kN including self-weight. Compare the magnitude of principal tension developed in beam with and without axial prestresss.	CO2	[K_4]
23.	Draw a neat sketch showing various transfer of prestress in pre-tensioned member and post tensioned member.	CO2	[K_4]
24.	A pretensioned beam of 150x250mm is prestressed with 3 wires of 8mmϕ stressed to 1200N/mm^2.Es=2.1x10^{5}N/mm^2. Ec=3x10^{4}N/mm^2. Calculate the loss due to elastic deformation. Take e=60mm.	CO3	[K_3]
25.	Calculate the transmission length of a pretension member with the following data: Span=50m, ϕ =7mm, μ =0.1, υ_c=0.15, υ_s=0.3, Es=210kN/mm^2, Ec=30kN/mm^2, f_{pu}=1500N/mm^2, f_{pi}=70% f_{pu}, f_{pe}=60% f_{pu}.	CO2	[K_2]
26.	Determine the design concept of partial prestressing.	CO3	[K_4]

Answer any FOUR Questions

PART D (4 x 10 = 40 Marks)

27.	A rectangular beam of 250 x 350 mm is prestressed with 10 wires of 5mmϕ wire located at a distance of 100mm from the soffit and 3 wires of 5mmϕ located at 50mm from the top and the stress in the wire is 900N/mm^2. It is subjected to a live load of 5kN/m over a span of 7m. Find the stress at top and bottom. a) Without live load b) With live load	CO1	[K_4]
28.	A post tensioned beam of 250mm wide is to be designed from an imposed load of 13kN/m uniformly distributed over a span of 1m. The stress in the concrete should not exceed 17.5N/mm^2 in compression and 1.5 N/mm^2 in tension. Loss=15%. Design the section using Magnels method.	CO2	[K_4]
29.	A composite T-beam of 5m span with rib of 100x250mm and in-situ slab of 350x40mm. if it is prestressed by a straight cable with an eccentricity 50mm and carrying an effective force of 150kN is subjected to live load of 3.5kN/m. Calculate the deflection for un propped and propped conditions, if Ecp=35kN/mm^2 and Ecc=30kN/mm^2.	CO2	[K_3]
30.	The end block of prestressed beam 100 mm x 200 mm supports an eccentric prestressing force of 1000 kN, the line of which coincides with bottom kern of the section. The depth of anchor plate is 50 mm. Estimate the magnitude and position of principle tensile stress. Design suitable reinforcement	CO3	[K_4]
31.	A cylindrical tank of 35m interval diameter is required to store water for a depth of 8.5m. The permissible compressive stress in concrete at transfer =14N/mm^2 and the minimum compressive stress under working is 1N/mm^2. η =0.80. 5mmϕ wires with initial stress of 1000N/mm^2 are available for circumferential winding and Fresyssinet cables with 12 wires of 8mmϕ are stressed to 1200N/mm^2 are available for vertical prestressing. Design the tank wall with hinged face, fck =40N/mm^2.	CO3	[K_4]

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