QPC: RJ18001173 AR - 18 Reg. No.

GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

B. Tech Degree Examinations, June – 2021

(Sixth Semester)

BCEPE6050 - PRESTRESSED ENGINEERING

(Civil Engineering)

Time: 2 hrs Maximum: 50 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) **(1 x 10 = 10 Marks)**

Q.1. Answer *ALL* questions			[CO#]	[PO#]
a.	What are the classifications of prestressed concrete structures?		CO1	PO1
	(i) Externally or internally prestressed	(ii) Pretensioning and post tensioning		
	(iii) Partial or full prestressing	(iv) All of the above		
b.	Post tensioned members are mainly useful for		CO1	PO1
	(i) Long or Short Span Structures	(ii) Short Span Structures only		
	(iii) Both of them	(iv) None of them		
c.	In Magnel-Blaton System the type of wedge used is		CO1	PO1
	(i) Circular tapered wedge	(ii) Rectangular flat wedge		
	(iii) steel bars with threaded ends	(iv) Tapered flat wedge		
d.	The desirable ratio of breadth of flange to effective depth, for unsymmetrical I section, should be in the range of		CO2	PO1
	(i) 0.8 to 1.0	(ii) 0.6 to 0.8		
	(iii) 0.6 to 1.0	(iv) 0.4 to 0.6		
e.	Unequal stress distribution at the anchorage zone occurs when ……is provided		CO2	PO1
	(i) Single Plate without Concentric	(ii) Double Anchor Plates		
	(iii) concentrically anchored	(iv) All of the above		
f.	If No tensile stresses are permitted under service loads and the structure is crack free at the working load then it is classified as		CO3	PO1
	(i) Type I structure	(ii) Type II structure		
	(iii) Type III structure	(iv) Type IV structure		
g.	The magnitude of deflection of a prestressed beam is directly proportional to		CO4	PO1
	(i) Modulus of elasticity of concrete	(ii) Second moment of area of the cross section		
	(iii) Prestressing force in the cable	(iv) All of the above		
h.	The deflection of a cracked prestressed concrete beam can be computed by		CO4	PO1
	(i) Stress-Strain Diagram	(ii) Bilinear Moment - Curvature relationship		
	(iii) Bending Moment Diagram	(iv) None of the above		
i.	The additional moment induced at a section due to the redundant reactions developed as a consequence of prestressing the structure is known as		CO5	PO1

(i) Primary Moment (ii) Secondary Moment
(iii) Resultant Moment (iv) Bending Moment

j. A tendon profile in which the eccentricity is proportional at all cross sections to the bending moment caused by any loading on a rigidity supported statically indeterminate — CO5 PO1

(i) Straight profile (ii) Parabolic profile
(iii) Inclined profile (iv) Concordant profile

PART – B: (Short Answer Questions) **(2 x 5 = 10 Marks)**

Q.2. Answer ***ALL*** questions	[CO#]	[PO#]
a. Why high strength is concrete is necessary for prestressed concrete members?	CO1	PO1
b. Enumerate load balancing concept.	CO2	PO1
c. What is meant by bursting force?	CO3	PO1
d. Mention factors affecting the deflection of the prestressed concrete beam?	CO4	PO1
e. What are the advantages of statically indeterminate prestressed concrete structures?	CO5	PO1

PART – C: (Long Answer Questions) **(6 x 5 = 30 Marks)**

Answer ***ANY FIVE*** questions	Marks	[CO#]	[PO#]
3. A rectangular beam of 250 mm wide and 400 mm deep is prestressed by means of 16 wires of 5 mm diameter located at 70 mm from the bottom of the beam and 3 wires of diameter 6 mm, 25 mm from the top. The initial prestress applied on the wires is 920 N/mm^2. The beam supports an UDL of 8 kN/m over a length 6 m. Assume density of concrete as 24.5 kN/m^3. Evaluate the maximum working stress in concrete.	(6)	CO2	PO2
4. A pretensioned beam 200 mm × 300 mm is prestressed by 10 wires each of 7 mm diameter, initially stressed to 1200 MPa with their centroids located 100 mm from the soffit. Estimate the final percentage loss of stress due to elastic deformation, creep, shrinkage and relaxation. Assume relaxation of steel stress = 60 MPa, E_s = 210 GPa, E_c = 36.9 GPa, creep coefficient = 1.6, and residual shrinkage strain = 3×10^{-4}.	(6)	CO3	PO2
5. A prestressed concrete beam of span 6 m with a rectangular section of 120 mm × 300 mm supports a UDL of 4 kN/m, which includes self-weight. The beam is concentrically prestressed by a cable carrying force of 180 kN. Locate the position of thrust line.	(6)	CO2	PO2
6. Briefly discuss about the Magnel's Method for design of anchorage zone.	(6)	CO4	PO1
7. A prestressed concrete beam of size 120 mm × 300 mm having span 6 m supports an imposed load of 4 kN/m. The beam is prestressed by a straight cable carrying an effective force of 280 kN at an eccentricity of 80 mm from centroid of the section. Take modulus of elasticity of concrete as 36.5 kN/mm^2 and unit weight as 24.5 kN/m^3. Compute the deflection at the following stages and check whether they comply with the IS code specifications.	(6)	CO4	PO3

(i) upward deflection under prestress + self-weight

(ii) final deflection under prestress + self-weight + imposed load including the effect of creep and shrinkage.
Take creep coefficient = 1.8.

8.	Write the expression for defection of prestressed member with trapezoidal tendon with neat sketch.	(6)	CO4	PO1
9.	A continuous beam ABC having spans AB = 10 m and BC = 10 m with uniform cross section 100 × 300 mm is prestressed by a cable carrying effective force of 360 kN. The cable is placed parallel to the axis of the beam at a distance 100 mm from the soffit. (i) Determine the secondary moment and resultant moment at the central support 'B' (ii) If the beam supports an imposed load of 1.5 kN/m, calculate the resultant stresses at top and bottom of the beam at B. Take the density of concrete as 24 kN/m^3.	(6)	CO5	PO4
10.	Two simply supported beams AB = BC = 10 m of rectangular section 200 × 600 mm, each post-tensioned by means of two parabolic cables with a prestressing force of 300 kN having eccentricities of zero at supports and 150 mm at mid span are converted into continuous beam by tensioning a parabolic cap cable carrying a force of 300 kN. The ends of the cap cable are located at 3m from the central support. The cable centre is 50 mm from the top of the beam over the central support B. (i) Calculate the secondary moment induced at B. (ii) Locate the resultant line of thrust through the beam AB. (iii) Resultant stresses at top and bottom	(6)	CO5	PO4

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