INSTITUTEOFAERONAUTICALENGINEERING

(Autonomous)

Dundigal, Hyderabad-500043

CIVIL ENGINEERING

TUTORIAL QUESTION BANK

Course Title	DESIGN OF PRESTRESSED CONCRETE STRUCTURES				
Course Code	BSTB22				
Programme	M.Tech				
Semester	III	ST			
Course Type	Elective				
Regulation	IARE - R18				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	-	3	-	-
Chief Coordinator	Mr. CH Venugopal Reddy, Assistant Professor				
Course Faculty	Mr. CH Venugopal Reddy, Assistant Professor				

COURSE OBJECTIVES:

The course should enable the students to:	
I	Find out losses in the prestressed concrete.
II	Understand the basic aspects of prestressed concrete fundamentals, including pre and post- tensioning processes..
III	Understand the material requirements as per specified norms and standards.
IV	Assess the valuation of buildings and provide practical knowledge of standard specifications of items of building construction.

COURSE OUTCOMES (COs):

CO 1	Understand different types of prestressing, losses, analysis of PSC flexural members and Codal provisions.
CO 2	Understand ultimate and serviceability limit states for flexure, design for shear, transmission force for pretensioning and post tensioning and anchorage zone stresses.
CO 3	Understand the determinacy of plane , space truss, analysis and design for plane , space truss, analysis and design of continuous beams and frames and cable profile linear transformation
CO 4	Understand composite construction with precast PSC beams , cast insitu R.C slab, analysis, design of composite beams, calculation of creep, shrinkage and crack width.
CO 5	Analysis and design of prestressed concrete pipes,columns with moments.

COURSE LEARNING OUTCOMES (CLOs):

BSTB22.01	Understand the concept of pre-stressing and the behaviour of concrete structures.
BSTB22.02	Recognize the general principles, methods of pre-stressing, and pre-stressing devices for pre-tensioning and post-tensioning.
BSTB22.03	Determine losses of pre-stress in pre-stressed concrete structures.
BSTB22.04	Apply the provisions of IS-1343(1980) code to the design of pre-stressed concrete structures for flexure and shear.
BSTB22.05	Understand the ultimate & serviceability limit statesfor flexure.
BSTB22.06	Design the shear reinforcements for pre-stressed concrete beams.
BSTB22.07	Understand the transmission force for pretensioningand posttensioning.
BSTB22.08	Understand Anchorage zone stresses for post tension members.
BSTB22.09	Understand the determinacy of plane and space trusses.
BSTB22.10	Understand the structural analysis for plane trussand space truss.
BSTB22.11	Understand the analysis and design of continuous beams and frames.
BSTB22.12	Understand the cable profile and linear transformation.
BSTB22.13	Understand the method of composite construction with precast PSC beams and cast insitu RC slab.
BSTB22.14	Analysis and design of composite beams.
BSTB22.15	Calculate the effects creep and shrinkage and paritalprestressing.
BSTB22.16	Able to calculate crack width.
BSTB22.17	Analysis of prestressed concrete pipes with moments.
BSTB22.18	Analysis of prestressed columns with moments.
BSTB22.19	Design of prestressed concrete pipes with moments.
BSTB22.20	Design of prestressed columns with moments.

TUTORIAL QUESTION BANK

UNIT- I				
INTRODUCTION TO PRESTRESSED CONCRETE				
Part - A (Short Answer Questions)				
S No	**QUESTIONS**	**Blooms Taxonomy Level**	**Course Outcomes**	**Course Learning Outcomes (CLOs)**
1	Define prestressed concrete.	Remember	CO 1	BSTB22.01
2	What are the advantages of PSC construction?	Understand	CO 1	BSTB22.01
3	Define Pre tensioning and Post tensioning.	Understand	CO 1	BSTB22.01
4	What is the need for the use of high strength concrete and tensile steel in prestressed Concrete?	Remember	CO 1	BSTB22.01
5	Define Axial prestressing.	Remember	CO 1	BSTB22.02
6	Explain the principle of post tensioning.	Understand	CO 1	BSTB22.02
7	What are the various methods of prestressing the concrete?	Understand	CO 1	BSTB22.02
8	Enumerate load balancing concept.	Understand	CO 1	BSTB22.03
9	What are the sources of prestress?	Remember	CO 1	BSTB22.02
10	Define Axial prestressing.	Understand	CO 1	BSTB22.02
11	Why loss due shrinkage is more for pretensioned member compared to post tensioned member?	Remember	CO 1	BSTB22.03
12	List the losses of prestress.	Remember	CO 1	BSTB22.03
13	Why loss due shrinkage is more for pretensioned member compared to post tensioned member?	Remember	CO 1	BSTB22.03
14	List the various types of losses of prestress in pretensioned and post tensioned member.	Remember	CO 1	BSTB22.03
15	How do you compute loss of stress due to elastic deformation of concrete?	Remember	CO 1	BSTB22.03
16	"Post tensioned members do not suffer the loss of prestress due to elastic deformation", Why?	Remember	CO 1	BSTB22.03
17	What is slip anchorage? How do you compute loss of stress due to anchorage slip?	Remember	CO 1	BSTB22.03
18	Explain the provisions made in IS: 1343 for relaxation loss.	Remember	CO 1	BSTB22.04
19	What are the factors affecting loss of stress due to creep of concrete?	Remember	CO 1	BSTB22.03
20	What is Relaxation of steel?	Understand	CO 1	BSTB22.03
Part - B (Long Answer Questions)				
1	A rectangular concrete beam 100mm wide & 250mm deep spanning over 8m is prestressed by a straight cable carrying a effective prestressing force of 250kN located at an eccentricity of 40mm. The beam supports a live load of 1.2kN/m. a) Calculate the resultant stress distribution for the centre of the span cross section of the beam assuming the density of concrete as 24kN/m2 b) Find the magnitude of prestressing force with an eccentricity of 40mm which can balance the stresses due to dead load & live load at the soffit of the centre span section.	Understand	CO 1	BSTB22.04
2	(i) Explain why high strength concrete and high strength steel are needed for PSC construction. (ii) State different types of prestressing.	Understand	CO 1	BSTB22.02
3	Discuss the advantages and disadvantages of partial prestressing.	Understand	CO 1	BSTB22.02
4	(i) Discuss the load deflection behaviour of under prestressed, partially prestressed and over prestressed members in detail. (ii) Explain concept of limit states, partial safety factor.	Understand	CO 1	BSTB22.02
5	a) What is meant by partial prestressing? Discuss the advantages and disadvantages when partial prestressing is done. b) Explain about the types of flexure failure occurs in prestressed concrete section.	Understand	CO 1	BSTB22.02

6	A PSC beam of 120 mm wide and 300 mm deep is used over a span of 6m to support a UDL of 4kN/m including its self weight. The beam is prestressed by a straight cable carrying a force of 180 kN& located at an eccentricity of 50mm. Determine the location of the thrust line in beam & plot its position at quarter & central span sections.	Understand	CO 1	BSTB22.04
7	A PSC beam of 230 mm wide and 450mm deep is used over an span of 4m is prestressed by a cable carrying a force of 650kN & located at an eccentricity of 75mm. The beam supports three concentrated loads of 25kN at each quarter span points. Determine the location of the pressure line in beam at centre, quarter & support sections. Neglect the moment due to self weight of the beam.	Understand	CO 1	BSTB22.04
8	A PSC beam supports an imposed load of $5kN/mm^2$ over a simply supported span of 10m.The beam has an I section with an overall depth of 450 mm. Thickness of flange and web are 75 mm and 1000 mm respectively. The flange width is 230 mm. the beam is prestressed with an effective prestressing force of 350 kN at a suitable eccentricity such that the resultant stress at the soffit of the beam at mid span is zero. Find the eccentricity required for the force.	Understand	CO 1	BSTB22.04
9	A PSC beam of section 120mm wide and 300mm deep is used over an effective span of 6m to support an UDL of 4kN/m including self weight. The beam is prestressed by a straight cable with a force of 180 kN and located at an eccentricity of 50 mm. Determine the location of thrust line in the beam and plot its position.	Understand	CO 1	BSTB22.04
10	A pretensioned concrete beam, 100mm wide and 300mm deep, is prestresssed by straight wires carrying an initial force of 225kN at an eccentricity of 55mm. The modulus of elasticity of steel and concrete are 210 and $35kN/mm^2$ respectively. Estimate the percentage loss of stress in steel due to elastic deformation of concrete if area of steel wires is $188\ mm^2$.	Understand	CO 1	BSTB22.03
11	A rectangular concrete beam, 360mm deep and 200mm wide, is prestressed by means of fifteen 5mm diameter wires located 65mm from the bottom of the beam and three 5mm wires, located 25mm from the top of the beam. If the wires are initially tensioned to a stress of $840kN/mm^2$, calculate the percentage loss of stress in steel immediately after transfer, allowing for the loss of stress due to elastic deformation of concrete only.	Understand	CO 1	BSTB22.03
12	A post-tensioned concrete beam, 100mm wide and 300mm deep, is prestressed by 3 cables, each with a cross sectional area of $50mm^2$ and with an initial stress of $1200N/mm^2$. 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 the three cables due to elastic deformation of concrete for only the following cases: (a) Simultaneous tensioning and anchoring of all three cables; (b) Successive tensioning of the three cables.	Understand	CO 1	BSTB22.03
13	A pretensioned beam 200mm x 300 mm is prestressed by 10 wires each of 7mm diameter, initially stressed to 1200MPa with their centroid located 100mm from the soffit. Estimate the final percentage loss of stress due to elastic deformation, creep, shrinkage and relaxation. Assume relaxation of steel stress=60MPa, E_S=210GPa, E_C=36.9GPa, creep coefficient =1.6 and residual shrinkage strain $=3 \times 10^{-4}$.	Understand	CO 1	BSTB22.03
14	A concrete beam is prestressed by a cable carrying an initial prestressing force of 300kN. The cross sectional area of the wires in the cable is $300mm^2$. Calculate the percentage of loss of stress in the cable only due to shrinkage of concrete using IS: 1343 recommendations assuming the beam to be (a) pretensioned (b) Post tensioned. Assume Es= $210kN/mm^2$ and age of concrete at transfer=8 days.	Understand	CO 1	BSTB22.03

15	A concrete beam of 10m span, 100mm wide and 300mm deep is prestressed by 3 cables. The area of each cable is 200mm^2 and the initial stress in the cable is 1200N/mm^2. Cable 1 is parabolic with an eccentricity of 50mm above the centroid at the supports and 50mm below at the centre of span. Cable 2 is also parabolic with zero eccentricity at supports and 50mm below the centroid at the centre of span. Cable 3 is straight with uniform eccentricity of 50mm below the centroid. If the cables are tensioned from one end only. Estimate the percentage loss of stress in each cable due to friction. Assume μ = 0.35 and k = 0.0015 per m.	Understand	CO 1	BSTB22.03
16	A rectangular concrete beam 360mm deep and 200mm wide is prestressed by means of fifteen 5mm diameter wires located 65mm from the bottom of the beam and three 5mm wires, located 25mm from the top of the beam. If the wires are initially tensioned to a stress of 840N/mm^2, calculate the percentage loss of stress due to elastic deformation of concrete only. E_S = 210 kN/mm2 and E_C = 31.5 kN/mm^2.	Understand	CO 1	BSTB22.03
17	A straight pretensionedprestressed concrete member 12 m long with a cross section of 400 mm wide and 500 mm deep is concentrically post tensioned by four tendons of 250 mm^2 each. The tendons are stressed one after another to the stress of 1000 N/mm^2. The eccentricity of prestressing force is 100 mm at the centre of the span. Compute the loss of prestress due to elastic shortening of concrete. How can the loss be counteracted?	Understand	CO 1	BSTB22.03
18	A Prestressedpretensioned beam of 200mm wide and 300mm deep is used over an span of 10m is prestressed with a wires of area 300mm^2 at an eccentricity of 60mm carrying a prestress of 1200N/mm^2 Find the percentage of loss of stress, Ec=35kN/mm^2, Shrinkage of concrete=300x10-6 , creep coefficient =1.6.	Understand	CO 1	BSTB22.03
19	A concrete beam is post tensioned by a cable carrying an initial stress of 1000N/mm^2. the slip at the jacking end was observed to be 5mm. The modulus of elasticity of steel is 210 kN/mm^2. Estimate the percentage of loss of stress due to anchorage slip if the length of beam is (a) 20m; (b) 5m.	Understand	CO 1	BSTB22.03
20	A pretensioned beam 300mm x 450mm is pretensioned by 12 wires each 7mm diameter, initially stressed to 1200MPa 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=90MPa. Ec =35GPa, creep co-efficient=1.6 and residual shrinkage strain =3 X10^{-4}.	Understand	CO 1	BSTB22.03
Part - C (Problem Solving and Critical Thinking Questions)				
1	A pretensioned concrete beam of rectangular cross section, 150 mm wide and 300mm deep, is prestressed by 8 high tensile wires of 7 mm diameter located at 100 mm from the soffit of the beam. if the wires are tensioned to a stress of 1100N/mm^2 ,calculate the percentage loss of stress due to elastic deformation assuming the modulus of elasticity of concrete and steel as 31.5 kN/mm^2 and 210 kN/mm^2.	Understand	CO 1	BSTB22.03
2	A rectangular concrete beam 360 mm deep and 200 mm wide is prestressed by means of 15 5 mm diameter wires located 65 mm from the bottom of the beam and 3 5mm wires, locating 25mm from the top of beam. If the wires are initially tensioned to a stress of 840N/mm^2, calculates the percentage loss of stress in steel immediately after transfer, allowing loss of stress due elastic deformation of concrete only.	Understand	CO 1	BSTB22.03
3	A concrete beam of rectangular cross section, 100 mm wide and 300 mm deep prestressed 5 wires of 7 mm diameter located at an eccentricity of 50 mm, the initial stress in the wires being 1200 N/mm2. Estimate the loss of stress in steel due to creep of concrete using the ultimate creep strain method and the creep coefficient method. Use the following data Es=210kN/mm^2, Ec=35kN/mm2, A=3x104 mm^2, Ultimate creep stain = 41 x10-6 mm/mm per N/mm^2. Creep coefficient = 1.6.	Understand	CO 1	BSTB22.04

4	A post tensioned concrete beam of rectangular cross section, 100mm wide and 300 mm deep, stressed by parabolic cable at zero eccentricity near the support and 50 mm eccentricity at the centre of span. The area of cable is 200 mm^2 and initial stress in cable is 1200 N/mm^2. The ultimate creep strain = 30 X10 -6mm/mm per N/mm^2 of stress and modulus of elasticity of steel is 210 kN/mm^2, compute the loss of stress only due to creep of concrete.	Understand	CO 1	BSTB22.04
5	A concrete beam is post tensioned by a cable carrying an initial stress of 1000 N/mm^2. The slip at the jacking end was observed to be 5mm. Es=210 KN/mm^2. estimate the loss of stress due to anchorage slip if the length of beam is (a) 50 m (b) 5m.	Understand	CO 1	BSTB22.02
6	A prestressed concrete beam with a rectangular section 150 mm wide by 350 mm deep supports a uniformly distributed load of 6kN/m, which includes the self weight of the beam. The effective span of the beam is 8 m. The beam is concentrically prestressed by a cable carrying a force of 200kN. Locate the position of the pressure line in the beam.	Understand	CO 1	BSTB22.04
7	A rectangular concrete beam 300 mm wide, 800 mm deep supports two concentrated loads of 20 kN each at third point of a span of 9m. a) Suggest a suitable cable profile. If eccentricity of the cable profile is 100 mm for middle third portion of the beam, calculate the prestressing force required to balance the bending effect of the concentrated loads neglecting the self weight. b) For the same cable profile find effective force in cable if the resultant stress due to self wt., imposed load, and prestressing force is zero at the bottom fiber of mid span section.(Assume density of concrete = 24 kN/m^3).	Understand	CO 1	BSTB22.03
8	A PSC beam supports a live load of 4kN/m over a simply supported span of 8m. The beam has an I-section with an overall depth of 400mm. the thickness of flange and web are 60mm and 80mm respectively. The beam is to be prestressed by an effective prestressing force of 234kN at a suitable eccentricity such that the resultant stress at the soffit of the beam at the centre span is zero. i) Find the eccentricity required for the force. ii) If tendon is concentric, what should be the magnitude of the prestressing force for the resultant stress to be zero at the bottom fibre of central span section?	Understand	CO 1	BSTB22.04
9	A PSC beam 550 x 750mm deep has S.S span of 12m. It is prestressed with the linear bent tendon with zero eccentricity and an eccentricity of 250mm below the axis of mid span. The beam carries a concentrated load of 250 KN at centre besides its self-weight. compare the extreme fibre stress at mid span using stress concept and load balancing concept.	Understand	CO 1	BSTB22.04
10	A rectangular concrete beam 250 mm wide by 300 mm deep is prestressed by a force of 540 kN at a constant eccentricity of 60mm.The beam supports a concentrated load of 68 kN at the centre of the span of 3 m. Determine the location of the pressure line at the centre, quarter span and support sections of the beam. Neglect the self weight of the beam.	Understand	CO 1	BSTB22.04
	UNIT-II			
	STATICALLY DETERMINATE PSC BEAMS			
	Part – A (Short Answer Questions)			
1	What are the types of flexural failure ?	Understand	CO 2	BSTB22.05
2	What is the transmission length?	Understand	CO 2	BSTB22.07
3	What are the essential devices used for post-tensioning ?	Understand	CO 2	BSTB22.08
4	What are the stages to be considered in the design of prestressed concrete section under flexure?	Understand	CO 2	BSTB22.05
5	What are the types of flexural failure encountered in prestressed concrete member?	Understand	CO 2	BSTB22.05
6	What is strain compatibility method?	Understand	CO 2	BSTB22.05
7	Write the assumptions in strain compatibility method of prestressed concrete sections.	Remember	CO 2	BSTB22.05

8	Compare the flexure failure of conventional RC beam with PSC beam.	Remember	CO 2	BSTB22.05
9	Explain with neat sketches the IS1343 code method of computing the moment of resistance of rectangular section.	Remember	CO 2	BSTB22.05
10	How do you compute the ultimate flexural strength of section with tensioned and untensioned reinforcement in tension zone of concrete sections?	Remember	CO 2	BSTB22.05
11	Distinguish between web shear and flexural shear cracks in PSC concrete beams with neat sketch.	Remember	CO 2	BSTB22.05
12	Write a short notes on straight and concentric tendons in prestressed concrete beams.	Understand	CO 2	BSTB22.05
13	Differentiate parabolic tendon and straight tendon with diagrams.	Understand	CO 2	BSTB22.07
14	What are the assumptions in prestressed concrete members under flexure?	Remember	CO 2	BSTB22.05
15	What are the stages to be considered in the design of prestressed concrete section under flexure?	Remember	CO 2	BSTB22.05
16	What are the types of flexural failure encountered in prestressed concrete member?	Remember	CO 2	BSTB22.05
17	What is strain compatibility method?	Remember	CO 2	BSTB22.05
18	Write the assumptions in strain compatibility method of prestressed concrete sections.	Remember	CO 2	BSTB22.05
19	Compare the flexure failure of conventional RC beam with PSC beam.	Remember	CO 2	BSTB22.05
20	What are the different ways of improving shear resistance in concrete members?.	Remember	CO 2	BSTB22.06
Part - B (Long Answer Questions)				
1	A pretensioned T section has a flange width of 1200mm and 150mm thick. The width and depth of the rib are 300mm and 1500mm respectively. The high tension steel has an area of 4700mm^2 and is located at an effective depth of 1600mm. If the characteristic cube strength of the concrete and the tensile strength of steel are 40 and 1600Mpa respectively; calculate the flexural strength of the section.	Understand	CO 2	BSTB22.05
2	A PSC beam of effective span 16m is of rectangular section 400mm wide and 1200mm deep. A tendon consists of 3300mm^2 of strands of characteristic strength of 1700N/mm^2 with an effective prestress of 910N/mm^2. The strands are located 870mm from the top face of the beam. If f_{cu}=60N/mm^2. estimate the flexural strength of the section as per IS1343 provisions for the following cases: (i) Bonded tendons (ii) Unbonded tendon	Understand	CO 2	BSTB22.05
3	A post tensioned bridge girder with unbonded tendons is of size 1200mm wide by 1800mm deep is of box section with wall thickness of 150mm. The high tensile steel has an area of 4000mm^2 and is located at an effective depth of 1600mm. The effective prestress in steel after loss is 1000N/mm^2& effective span is 24m. If f_{ck} = 40 N/mm^2, f_p=1600N/mm^2 Estimate the flexural strength.	Understand	CO 2	BSTB22.05
4	Enumerate the Permissible stresses in steel and concrete as per I.S.1343 Code.	Understand	CO 2	BSTB22.05
5	The cross section of a prestressed concrete beam is an unsymmetrical T-section with an overall depth of1300mm. thickness of web is 150mm. Distance of top and bottom fibres from the centroid are 545mm and 755mm respectively. At a particular section, the beam is subjected to an ultimate moment M = 2130kNm and a shear force V=237kN. Effective depth d = 1100mm, f_{ck}= 45N/mm^2, f_{ep}=19.3 N/mm^2 ,I=665x10^{8}mm^4, A_p= 2310mm^2, f_p=1500N/mm^2, f_{ep}=890N/mm^2. Estimate the flexural-shear resistance using IS code.	Understand	CO 2	BSTB22.07

6	A symmetrical I-section prestressed beam of 300mm wide and 750mm overall depth with flanges and web 100mm thick. The beam is post tensioned with the cables containing 48 wires of 5mm diameter high strength steel wires at an eccentricity of 250mm. the compressive strength of concrete is 40N/mm^2 and the ultimate tensile strength of wire is 1700N/mm^2. Assuming that the grout of tendons is 100% effective, determine the ultimate moment of section as per IS: 1343: 1980.	Understand	CO 2	BSTB22.05
7	What do you understand by Type I and Type II members? Explain in details.	Understand	CO 2	BSTB22.05
8	Discuss the Basic assumptions for calculating flexural stresses. Explain concept of limit states.	Understand	CO 2	BSTB22.05
9	The cross-section of a symmetrical I-section prestressed beam is 400mm by 750mm (overall), with flanges and web 250mm thick. The beam is post-tensioned by cables containing 45 wires of 5mm diameter high-tensile steel wires at an eccentricity of 350mm. The 28-days strength of concrete in compressing is 40 N/mm^{2}and the ultimate tensile strength of wires is 16500N/mm^2. Assuming that the grouting of the tendons is 100 percent effective, determine the ultimate moment of the section as per IS 1343.	Understand	CO 2	BSTB22.05
10	Discuss in detail the strain compatibility method with neat sketch.	Understand	CO 2	BSTB22.05
11	A PSC beam of effective span 16m is of rectangular section 400mm wide and 1200mm deep. A tendon consists of 3300mm^2 of strands of characteristic strength of 1700N/mm^2 with an effective prestress of 910N/mm^2. The strands are located 870mm from the top face of the beam. If f_{cu}=60N/mm^2. estimate the flexural strength of the section as per IS1343 provisions for the following cases: (i) Bonded tendons (ii) Unbonded tendon	Understand	CO 2	BSTB22.05
12	A post tensioned bridge girder with unbonded tendons is of size 1200mm wide by 1800mm deep is of box section with wall thickness of 150mm. The high tensile steel has an area of 4000mm^2 and is located at an effective depth of 1600mm. The effective prestress in steel after loss is 1000N/mm^2& effective span is 24m. If f_{ck} = 40 N/mm^2, f_p=1600N/mm^2 Estimate the flexural strength.	Understand	CO 2	BSTB22.05
13	Enumerate the Permissible stresses in steel and concrete as per I.S.1343 Code.	Understand	CO 2	BSTB22.05
14	The cross section of a prestressed concrete beam is an unsymmetrical T-section with an overall depth of1300mm. thickness of web is 150mm. Distance of top and bottom fibres from the centroid are 545mm and 755mm respectively. At a particular section, the beam is subjected to an ultimate moment M = 2130kNm and a shear force V=237kN. Effective depth d = 1100mm, f_{ck}= 45N/mm^2, f_{ep}=19.3 N/mm^2 ,I=665x10^{8}mm^4, A_p= 2310mm^2, f_p=1500N/mm^2, f_{ep}=890N/mm^2. Estimate the flexural-shear resistance using IS code.	Understand	CO 2	BSTB22.05
15	A symmetrical I-section prestressed beam of 300mm wide and 750mm overall depth with flanges and web 100mm thick. The beam is post tensioned with the cables containing 48 wires of 5mm diameter high strength steel wires at an eccentricity of 250mm. the compressive strength of concrete is 40N/mm^2 and the ultimate tensile strength of wire is 1700N/mm^2. Assuming that the grout of tendons is 100% effective, determine the ultimate moment of section as per IS: 1343: 1980.	Understand	CO 2	BSTB22.05
16	What do you understand by Type I and Type II members? Explain in details.	Understand	CO 2	BSTB22.05
17	Discuss the Basic assumptions for calculating flexural stresses. Explain concept of limit states.	Understand	CO 2	BSTB22.05
18	The cross-section of a symmetrical I-section prestressed beam is 400mm by 750mm (overall), with flanges and web 250mm thick. The beam is post-tensioned by cables containing 45 wires of 5mm diameter high-tensile steel wires at an eccentricity of 350mm. The 28-days strength of concrete in compressing is 40 N/mm^{2}and the ultimate tensile strength of wires is 16500N/mm^2. Assuming that the grouting of the tendons is 100 percent effective, determine the ultimate moment of the section as per IS 1343.	Understand	CO 2	BSTB22.05

19	Discuss in detail the strain compatibility method with neat sketch.	Understand	CO 2	BSTB22.05
20	A PSC beam of effective span 16m is of rectangular section 400mm wide and 1200mm deep. A tendon consists of 3300mm^2 of strands of characteristic strength of 1700N/mm^2 with an effective prestress of 910N/mm^2. The strands are located 870mm from the top face of the beam. If f_{cu}=60N/mm^2. estimate the flexural strength of the section as per IS1343 provisions for the following cases: (i) Bonded tendons (ii) Unbonded tendon	Understand	CO 2	BSTB22.05
	Part - C (Problem Solving and Critical Thinking Questions)			
1	A post tensioned bridge girder with unbonded tendons is of size 1500mm wide by 1800mm deep is of box section with wall thickness of 250mm. The high tensile steel has an area of 3000mm^2 and is located at an effective depth of 1200mm. The effective prestress in steel after loss is 800N/mm^2& effective span is 20m. If f_{ck} = 40 N/mm^2, f_p = 1600 N/mm^2 Estimate the flexural strength.	Understand	CO 2	BSTB22.05
2	A pre-tensioned T section has a flange width of 1000 mm and 200mm thick.The width and depth of the rib are 350 mm and 1250mm respectively. The high tension steel has an area of 4000mm^2 and is located at an effective depth of 1400mm. If the characteristic cube strength of the concrete and the tensile strength of steel are 38 and 1500Mpa respectively; calculate the flexural strength of the section**.**	Understand	CO 2	BSTB22.05
3	The cross-section of a symmetrical I-section prestressed beam is 700mm by 550mm (overall), with flanges and web 250mm thick. The beam is post-tensioned by cables containing 35 wires of 7mm diameter high-tensile steel wires at an eccentricity of 300mm. The 28-days strength of concrete in compressing is 45N/mm^{2}and the ultimate tensile strength of wires is 16500N/mm^2. Assuming that the grouting of the tendons is 100 percent effective, determine the ultimate moment of the section as per IS 1343.	Understand	CO 2	BSTB22.05
4	A pre-tensioned beam of rectangular section 350mm wide by 750mm deep is stressed by 950mm^2 of high tensile steel at an effective depth of 600mm. The beam is provided with two 30mm diameter, high yield strength deformed bars both at the tension and compression faces with an effective cover of 55mm. Given fc=45N/mm^2, f_{pu}=1650N/mm^2, f_y=460N/mm^2 and (f_{py}/f_{pu}) =0.9, estimate the ultimate moment capacity of the section using ACI provision.	Understand	CO 2	BSTB22.05
5	The cross-section of a symmetrical I-section prestressed beam is 500 mm by 650 mm (overall), with flanges and web 150 mm thick. the beam is post-tensioned by cables containing 45 wires of 5 mm diameter high-tensile steel wires at an eccentricity of 250 mm. The 28-days strength of concrete in compressing is 40 N/mm^{2}and the ultimate tensile strength of wires is 16500 N/mm^2. Assuming that the grouting of the tendons is 100 percent effective, determine the ultimate moment of the section as per IS 1343.	Understand	CO 2	BSTB22.05
6	A pre-tensioned T section has a flange width of 1200mm and 150mm thick. The width and depth of the rib are 300mm and 1500mm respectively. The high tension steel has an area of 4700mm^2 and is located at an effective depth of 1600mm. if the characteristic cube strength of the concrete and the tensile strength of steel are 40 and 1600Mpa respectively; calculate the flexural strength of the section.	Understand	CO 2	BSTB22.05
7	The end block of a post tensioned bridge girder is 500mm wide by 1000mm deep.Two cables, each comprising 90 high tensile wires of 7mm dia are anchored using square plates of side length 400mm with their centres located at 500mm from the topand bottom of the edges of the beam. The jacking force in each cable is 4000kN.Design a suitable anchorage reinforcement using Fe 415 grade HYSD barsConforming to IS: 1343 provision.	Understand	CO 2	BSTB22.06
8	The end block of a PSC beam with rectangular cross section is 100mm wide and200mm deep. The prestressing force of 100kN is transmitted to the concrete by a distribution plate of 100mm x 50mm concentrically loaded at the ends. Calculate the position and the magnitude of tensile stress on the horizontal section through thecentre and edge of the anchor plate. Compute the bursting tension on the horizontal planes.	Understand	CO 2	BSTB22.08

9	A PSC beam 250mm wide and 650mm deep is subjected to an effective pre stressing force of 1360kN along the centroidal axis. The cable is placed symmetrically over the mild steel anchor plate of area 150mmx 350mm. Design the end block. Take fck=30N/mm2.Assume initial prestressing force is 1.2 times the effective pre stressing force.	Understand	CO 2	BSTB22.08
10	The cross-section of a symmetrical I-section prestressed beam is 500 mm by 650 mm (overall), with flanges and web 150 mm thick. the beam is post-tensioned by cables containing 45 wires of 5 mm diameter high-tensile steel wires at an eccentricity of 250 mm. The 28-days strength of concrete in compressing is 40 $N/mm^2$and the ultimate tensile strength of wires is 16500 N/mm^2. Assuming that the grouting of the tendons is 100 percent effective, determine the ultimate moment of the section as per IS 1343.	Understand	CO 2	BSTB22.05
UNIT -III				
STATICALLY INDETERMINATE STRUCTURES				
Part - A (Short Answer Questions)				
1	Define the concordance?	Remember	CO 3	BSTB22.09
2	Dedinetransmission length?	Remember	CO 3	BSTB22.10
3	Define anchorage zone.	Remember	CO 3	BSTB22.09
4	Define Bursting tension.	Remember	CO 3	BSTB22.10
5	Define degree of prestressing.	Remember	CO 3	BSTB22.09
6	What are the code provisions for bond and transmission length?	Remember	CO 3	BSTB22.09
7	What is effective reinforcement ratio?	Remember	CO 3	BSTB22.10
8	What is meant by end block in a post tensioned member?	Remember	CO 3	BSTB22.12
9	Sketch the pattern of reinforcement in anchorage zone.	Remember	CO 3	BSTB22.12
10	What are the methods of stress analysis in anchorage zone?	Remember	CO 3	BSTB22.12
11	What are the methods of stress analysis in anchorage zone?	Remember	CO 3	BSTB22.12
12	Draw the neat sketches of arrangements of reinforcement of end blocks.	Remember	CO 3	BSTB22.12
13	Write the expression for the bursting tension in guyon’s method.	Remember	CO 3	BSTB22.10
14	Define Guyon’s method.	Remember	CO 3	BSTB22.10
15	List the method of investigation the anchorage zone stresses.	Remember	CO 3	BSTB22.12
16	Define end zone reinforcement.	Remember	CO 3	BSTB22.12
17	Define the stress distribution in the end block.	Remember	CO 3	BSTB22.10
18	What are the methods of stress analysis in anchorage zone?	Remember	CO 3	BSTB22.10
19	Draw the neat sketches of arrangements of reinforcement of end blocks.	Remember	CO 3	BSTB22.10
20	Write the expression for the bursting tension in guyon’s method.	Remember	CO 3	BSTB22.11
Part – B (Long Answer Questions)				
1	A two span continuous beam ABC (AB=BC= 10 m) is of rectangular section , 200 mm wide by 500mm deep .The beam is pre-stressed by a parabolic cable, concentric at end support end having an eccentricity of 100 mm towards the soffit of the beam as centre of spans and 200mm towards the top at mid support .The effective force in the 500KN.(a) Show that the cable is concordant .(b) Locate the pressure line in the beam when it supports a live load of 5.6 KN/m in addition to its self- weight.	Understand	CO 3	BSTB22.10
2	A concrete beam having a rectangular section of 100mm wide and 300 mm deep is pre-stressed by a parabolic cable carrying an initial force of 200 KN. The cable has an the eccentricity of 50mm at the centre of the spa and is concentric at the support .If the span of the beam is 10m and the live load is 2 KN/m , estimate the short time deflection at the centre of span . Assuming E = 38 KN/ mm^2 and creep coefficient $\phi = 2$, los of pre-stress = 20% of the initial stress after 6 months . Estimate the long- time deflection at the centre of span at this stage , assuming that the dead and live loads are simultaneously applied after the release of pre-stress.	Understand	CO 3	BSTB22.10

3	A concrete beam with a cross- sectional area of 32×10^3 mm^2 and radius of gyration of 74 mm is pre-stressed by a parabolic cable carrying an effective stress o 1000 N/mm^2.The span of beam is 8m . The cable composed of 6 wires of 7 mm diameter has an eccentricity of 50 mm at the centre and zero at the support . Neglecting all losses , find the central deflection of the beam as follows : (a) self – weight + pre-stress.(b) self – weight + pre-stress +live load 2 KN/ m.	Understand	CO 3	BSTB22.11
4	A concrete beam with a cross- sectional area of 32×10^3 mm^2 and radius of gyration of 72 mm is pre-stressed by a parabolic cable carrying an effective stress o 1000 N/mm^2.The span of beam is 8m . The cable composed of 6 wires of 7 mm diameter has an eccentricity of 50 mm at the centre and zero at the support . Neglecting all losses , find the central deflection of the beam as follows : (a) self – weight + pre-stress.(b) self – weight + pre-stress +live load 2 KN/ m.	Understand	CO 3	BSTB22.11
5	A pre-stressed concrete beam supports an imposed load of the 4 KN /m over an effective span of 10 m. the beam has a rectangular section with a width of 200 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 100mm at the centre and zero at the ends, for the following condition .If the bending effect of the pre-stressing force is nullified by imposed load for the mid-span section (neglecting self – weight of the beam).	Understand	CO 3	BSTB22.11
6	A pre-stressed concrete beam supports an imposed load of the 4 KN /m over an effective span of 10 m. the beam has a rectangular section with a width of 200 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 100mm at the centre and zero at the ends, for the following condition. If the resultant stress due to self-weight, imposed load and pre-stressing force is zero at the soffit of the beam for the mid-span section. Assume D_C =24 KN/m^3	Understand	CO 3	BSTB22.12
7	A pre-stressed concrete beam supports an imposed load of the 4 KN /m over an effective span of 10 m. the beam has a rectangular section with a width of 200 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 100mm at the centre and zero at the ends, for the following condition .If the bending effect of the pre-stressing force is nullified by imposed load for the mid-span section (neglecting self – weight of the beam).	Understand	CO 3	BSTB22.12
9	A pre-stressed concrete beam supports an imposed load of the 4 KN /m over an effective span of 10 m. the beam has a rectangular section with a width of 200 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 100mm at the centre and zero at the ends, for the following condition. If the resultant stress due to self-weight, imposed load and pre-stressing force is zero at the soffit of the beam for the mid-span section. Assume D_C =24 KN/m^3.	Understand	CO 3	BSTB22.11
10	A two span continuous beam ABC (AB=BC= 12 m) is of rectangular section , 200 mm wide by 500mm deep .The beam is pre-stressed by a parabolic cable, concentric at end support end having an eccentricity of 100 mm towards the soffit of the beam as centre of spans and 200mm towards the top at mid support .The effective force in the 500KN.(a) Show that the cable is concordant .(b) Locate the pressure line in the beam when it supports a live load of 5.6 KN/m in addition to its self- weight.	Understand	CO 3	BSTB22.12
11	A two span continuous beam ABC (AB=BC= 10 m) is of rectangular section , 300 mm wide by 500mm deep .The beam is pre-stressed by a parabolic cable, concentric at end support end having an eccentricity of 100 mm towards the soffit of the beam as centre of spans and 200mm towards the top at mid support .The effective force in the 500KN.(a) Show that the cable is concordant .(b) Locate the pressure line in the beam when it supports a live load of 5.6 KN/m in addition to its self- weight.	Understand	CO 3	BSTB22.10

12	A concrete beam with a cross- sectional area of 35×10^3 mm^2 and radius of gyration of 74 mm is pre-stressed by a parabolic cable carrying an effective stress o 1000 N/mm^2.The span of beam is 8m . The cable composed of 6 wires of 7 mm diameter has an eccentricity of 50 mm at the centre and zero at the support . Neglecting all losses , find the central deflection of the beam as follows : (a) self – weight + pre-stress.(b) self – weight + pre-stress +live load 2 KN/ m.	Understand	CO 3	BSTB22.10
13	A concrete beam with a cross- sectional area of 40×10^3 mm^2 and radius of gyration of 75 mm is pre-stressed by a parabolic cable carrying an effective stress o 1000 N/mm^2.The span of beam is 8m . The cable composed of 6 wires of 7 mm diameter has an eccentricity of 50 mm at the centre and zero at the support . Neglecting all losses , find the central deflection of the beam as follows : (a) self – weight + pre-stress.(b) self – weight + pre-stress +live load 2 KN/ m.	Understand	CO 3	BSTB22.11
14	A pre-stressed concrete beam supports an imposed load of the 4 KN /m over an effective span of 10 m. the beam has a rectangular section with a width of 200 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 100mm at the centre and zero at the ends, for the following condition .If the bending effect of the pre-stressing force is nullified by imposed load for the mid-span section (neglecting self – weight of the beam).	Understand	CO 3	BSTB22.10
15	A pre-stressed concrete beam supports an imposed load of the 4 KN /m over an effective span of 10 m. the beam has a rectangular section with a width of 300 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 100mm at the centre and zero at the ends, for the following condition. If the resultant stress due to self-weight, imposed load and pre-stressing force is zero at the soffit of the beam for the mid-span section. Assume D_C =24 KN/m^3	Understand	CO 3	BSTB22.12
16	A pre-stressed concrete beam supports an imposed load of the 4 KN /m over an effective span of 10 m. the beam has a rectangular section with a width of 250 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 100mm at the centre and zero at the ends, for the following condition .If the bending effect of the pre-stressing force is nullified by imposed load for the mid-span section (neglecting self – weight of the beam).	Understand	CO 3	BSTB22.10
17	A pre-stressed concrete beam supports an imposed load of the 4 KN /m over an effective span of 15 m. the beam has a rectangular section with a width of 200 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 100mm at the centre and zero at the ends, for the following condition. If the resultant stress due to self-weight, imposed load and pre-stressing force is zero at the soffit of the beam for the mid-span section. Assume D_C =24 KN/m^3.	Understand	CO 3	BSTB22.09
18	A concrete beam with a cross- sectional area of 32×10^3 mm^2 and radius of gyration of 74 mm is pre-stressed by a parabolic cable carrying an effective stress o 1000 N/mm^2.The span of beam is 8m . The cable composed of 6 wires of 7 mm diameter has an eccentricity of 50 mm at the centre and zero at the support . Neglecting all losses , find the central deflection of the beam as follows : (a) self – weight + pre-stress.(b) self – weight + pre-stress +live load 2 KN/ m.	Understand	CO 3	BSTB22.09
19	A concrete beam with a cross- sectional area of 32×10^3 mm^2 and radius of gyration of 72 mm is pre-stressed by a parabolic cable carrying an effective stress o 1000 N/mm^2.The span of beam is 8m . The cable composed of 6 wires of 7 mm diameter has an eccentricity of 50 mm at the centre and zero at the support . Neglecting all losses , find the central deflection of the beam as follows : (a) self – weight + pre-stress.(b) self – weight + pre-stress +live load 3 KN/ m.	Understand	CO 3	BSTB22.12

20	A pre-stressed concrete beam supports an imposed load of the 4 KN /m over an effective span of 13 m. the beam has a rectangular section with a width of 200 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 100mm at the centre and zero at the ends, for the following condition .If the bending effect of the pre-stressing force is nullified by imposed load for the mid-span section (neglecting self – weight of the beam).	Understand	CO 3	BSTB22.09
Part – C (Problem Solving and Critical Thinking)				
1	A concrete beam with a cross- sectional area of 32×10^3 mm^2 and radius of gyration of 74 mm is pre-stressed by a parabolic cable carrying an effective stress o 1000 N/mm^2.The span of beam is 8m . The cable composed of 7 wires of 7 mm diameter has an eccentricity of 50 mm at the centre and zero at the support . Neglecting all losses , find the central deflection of the beam as follows : (a) self – weight + pre-stress.(b) self – weight + pre-stress +live load 2 KN/ m.	Understand	CO 3	BSTB22.10
2	A concrete beam with a cross- sectional area of 32×10^3 mm^2 and radius of gyration of 72 mm is pre-stressed by a parabolic cable carrying an effective stress o 1000 N/mm^2.The span of beam is 8m . The cable composed of 8 wires of 7 mm diameter has an eccentricity of 50 mm at the centre and zero at the support . Neglecting all losses , find the central deflection of the beam as follows : (a) self – weight + pre-stress.(b) self – weight + pre-stress +live load 2 KN/ m.	Understand	CO 3	BSTB22.09
3	A pre-stressed concrete beam supports an imposed load of the 4 KN /m over an effective span of 14 m. the beam has a rectangular section with a width of 200 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 100mm at the centre and zero at the ends, for the following condition .If the bending effect of the pre-stressing force is nullified by imposed load for the mid-span section (neglecting self – weight of the beam).	Understand	CO 3	BSTB22.09
4	A pre-stressed concrete beam supports an imposed load of the 4 KN /m over an effective span of 10 m. the beam has a rectangular section with a width of 200 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 125mm at the centre and zero at the ends, for the following condition. If the resultant stress due to self-weight, imposed load and pre-stressing force is zero at the soffit of the beam for the mid-span section. Assume D_C =24 KN/m^3	Understand	CO 3	BSTB22.12
5	A pre-stressed concrete beam supports an imposed load of the 4 KN /m over an effective span of 10 m. the beam has a rectangular section with a width of 250 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 100mm at the centre and zero at the ends, for the following condition .If the bending effect of the pre-stressing force is nullified by imposed load for the mid-span section (neglecting self – weight of the beam).	Understand	CO 3	BSTB22.11
06	A pre-stressed concrete beam supports an imposed load of the 4 KN /m over an effective span of 10 m. the beam has a rectangular section with a width of 250 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 110mm at the centre and zero at the ends, for the following condition .If the bending effect of the pre-stressing force is nullified by imposed load for the mid-span section (neglecting self – weight of the beam).	Understand	CO 3	BSTB22.10
07	A pre-stressed concrete beam supports an imposed load of the 5 KN /m over an effective span of 15 m. the beam has a rectangular section with a width of 200 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 100mm at the centre and zero at the ends, for the following condition. If the resultant stress due to self-weight, imposed load and pre-stressing force is zero at the soffit of the beam for the mid-span section. Assume D_C =24 KN/m^3.	Understand	CO 3	BSTB22.11

08	A concrete beam with a cross- sectional area of 35×10^3 mm^2 and radius of gyration of 74 mm is pre-stressed by a parabolic cable carrying an effective stress o 1000 N/mm^2.The span of beam is 8m . The cable composed of 6 wires of 7 mm diameter has an eccentricity of 50 mm at the centre and zero at the support . Neglecting all losses , find the central deflection of the beam as follows : (a) self – weight + pre-stress.(b) self – weight + pre-stress +live load 2 KN/ m.	Understand	CO 3	BSTB22.09
09	A concrete beam with a cross- sectional area of 36×10^3 mm^2 and radius of gyration of 72 mm is pre-stressed by a parabolic cable carrying an effective stress o 1000 N/mm^2.The span of beam is 8m . The cable composed of 6 wires of 7 mm diameter has an eccentricity of 75 mm at the centre and zero at the support . Neglecting all losses , find the central deflection of the beam as follows : (a) self – weight + pre-stress.(b) self – weight + pre-stress +live load 3 KN/ m.			BSTB22.12
10	A pre-stressed concrete beam supports an imposed load of the 3 KN /m over an effective span of 13 m. the beam has a rectangular section with a width of 275 mm and depth of 600mm, Find the effective pre-stressing force in the cable if it is parabolic with the an eccentricity of 100mm at the centre and zero at the ends, for the following condition .If the bending effect of the pre-stressing force is nullified by imposed load for the mid-span section (neglecting self – weight of the beam).	Understand	CO 3	BSTB22.11
UNIT -IV				
COMPOSITE CONSTRUCTION				
Part – A (Short Answer Questions)				
1	Define propped construction in composite PSC construction?	Remember	CO 4	BSTB22.13
2	Describe how to achieve compositeness between precast and cast in-situ part?	Remember	CO 4	BSTB22.13
3	List the effects of differential shrinkage in composite beams?	Remember	CO 4	BSTB22.13
4	Differentiate between propped and unpropped composite construction?	Remember	CO 4	BSTB22.13
5	Describe about shear connectors in composite construction?	Understand	CO 4	BSTB22.13
6	List the advantages of composite prestressed concrete beams.	Remember	CO 4	BSTB22.13
7	How do you the shrinkage and resultant stresses in composite member?	Understand	CO 4	BSTB22.13
8	What are the advantages of continuous members in prestressed concrete structures?	Understand	CO 4	BSTB22.14
9	Explain the term primary moment, secondary moment and resultant moment.	Understand	CO 4	BSTB22.14
10	What are cap cables and where they are used?	Understand	CO 4	BSTB22.15
11	List the commonly used methods to analyse the secondary moments in prestressed concrete continuous members.	Remember	CO 4	BSTB22.14
12	Draw any four types of composite prestressed concrete sections.	Remember	CO 4	BSTB22.13
13	The effects of prestressing the indeterminate structures?	Remember	CO 4	BSTB22.14
14	Write about redundant reaction with respect to prestressed concrete continuous members?	Remember	CO 4	BSTB22.15
15	Sketch a typical concordant cable profile in a two span continuous prestressed concrete beam.	Remember	CO 4	BSTB22.15
16	Explain how do you form the bonding between prestressed units and reinforced units?	Remember	CO 4	BSTB22.13
17	Explain the method of computing the ultimate shear strength in composite PSC members.	Remember	CO 4	BSTB22.15
18	Define anchorage zone.	Remember	CO 4	BSTB22.14
19	Define Bursting tension.	Remember		BSTB22.15
20	Define degree of prestressing.	Remember	CO 4	BSTB22.16
Part – B (Long Answer Questions)				
1	Explain Mohr's theorem to determine the short term deflections of uncracked members.	Understand	CO 4	BSTB22.16
2	Discuss effect of various tendon profiles on deflection and derive the equations for deflection.	Understand	CO 4	BSTB22.16

3	A precast pre tensioned beam of rectangular section has a breadth of 100mm and depth of 200mm. The beam with an effective span of 5m is pre stressed by the tendons with their centroids coinciding with the bottom kern. The initial force in the tendons is 150kN. The loss of prestress is 15%. The top flange width is 400mm with the thickness of 40mm.If the composite beam supports a live load of $7kN/m^2$ calculate the resultant stresses developed if the section is unpropped. M40 and M20 concrete are used for pre tensioned and in-situ concrete.	Understand	CO 4	BSTB22.14
4	Design a composite slab for the bridge deck using a standard inverted T-section. The top flange is 300mm wide and 110mm thick. The bottom flange is 550mm wide and 250mm thick. The web thickness is 100mm and the overall depth of the inverted T. Section is 655mm. The bridge deck has to support a characteristic imposed load of $50kN/m^2$, over an effective span of 12m. Grade 40 concrete is specified for the precast pretensioned T-with a compressive strength at transfer of 36 N/mm^2. Concrete of grade-30 is used for the in situ part. Calculate the minimum pre stress necessary and check for safety under serviceability limit state.	Understand	CO 4	BSTB22.14
5	Explain the advantages of using precast prestressed elements along with in-situ concrete.	Remember	CO 4	BSTB22.13
6	The cross-section of a composite beam consists of a 300mm x 900mm precast stem and cast-in-situ flange 900mm x 150mm. The stem is a post-tensioned unit with an initial prestressing force of 2500kN. The effective prestress available after making deduction for losses is 2200kN. The dead load moment at mid span due to the weight of the precast section is 250kNm. The dead load moment due to the weight of the flange is 125kNm. After hardening of the flange concrete, the composite section has to carry a live load which produces a bending moment of 700kNm. Examine the stress distribution in concrete at the various stages of the loading.	Understand	CO 4	BSTB22.14
7	A prestressed beam with rectangular cross section with a width of 120mm and depth of 300mm is continuous over two spans AB=BC=8m. The cable with zero eccentricity at the ends and an eccentricity of 50mm towards the top fibres of the beam over the central support carries an effective force of 500kN.	Understand	CO 4	BSTB22.14
8	A continuous beam ABC (AB=BC=10m) is prestressed by a parabolic cable carrying an effective force of 200kN. The cable profile is shown in Fig. The beam supports dead load and live load of 0.24kN/m and 2.36kN/m respectively. Calculate the resultant moments developed in the beam and locate the pressure line.	Understand	CO 4	BSTB22.14
9	Explain how long term deflections are predicted in prestressed members.	Understand	CO 4	BSTB22.16
10	Write step by step design procedure for composite construction.	Understand	CO 4	BSTB22.14
11	A composite T-beam is made up of a pretension rib 100mm wide and 200mm deep, and a cast in situ slab 400mm wide and 40mm thick having a modulus of elasticity of $28kN/mm^2$. If the differential shrinkage is $100x10^{-6}$ units, determine the shrinkage stresses developed in the precast and cast in situ units.	Understand	CO 4	BSTB22.14
12	Discuss in detail about the factors which influence flexural strength and shear strength of composite prestressed section.	Understand	CO 4	BSTB22.13
13	A prestressed concrete beam of rectangular section 120mm wide and 300mm deep, spans over 6m.the beam is prestressed by a straight cable carrying an effective force of 200kNat an eccentricity of 50mm. the modulus of elasticity of concrete is 38kN/m2.ompute the deflections at centre span for the following case: (i) deflection under prestress and self-weight; (ii) Find the magnitude of udl live load which will nullify the deflection due to prestress and self weight.	Understand	CO 4	BSTB22.13

14	A per stressed concrete beam having a cross sectional area of 3x 104 mm^2 is a simply supported over a span of 10m. Its supports a uniformly distributed imposed load of 3kN/m, Half of which is not permanent. The tendons follow a trapezoidal profile with an eccentricity of 100mm with in the middle third of the span and vary linearly from the third span points to zero at the supports. The area of the tendons A_p=350mm^2 having effective pre stressed of 1290N/mm2 immediately after transfer. Calculate the short term and long term deflection.	Understand	CO 4	BSTB22.15
15	Explain the types of composite construction.	Understand	CO 4	BSTB22.13
16	Discuss in detail the phenomenon of differential shrinkage in prestressed concrete members.	Understand	CO 4	BSTB22.15
17	Discuss about the importance of control of deflection and the factors influencing the deflection of PSC beams.	Understand	CO 4	BSTB22.16
18	A rectangular concrete beam of cross section 150mm wide and 300mm deep is simply supported over a span of 8m and is prestressed by means of a symmetric parabolic cable at a distance of 75mm from the bottom of the beam at mid span and 125mm from the top of the beam at support sections. If the forces in the cable is 350kN and the modulus of elasticity of concrete is 38kN/mm^2 calculate, the deflection at mid span when the beam is supported its own weight and the concentration load which must be applied at mid span to restore it to the level of supports.	Understand	CO 4	BSTB22.16
19	(i) Explain the types of composite construction with neat sketch. (ii) Explain the precast prestressed concrete stresses at serviceability limit state.	Understand	CO 4	BSTB22.13
20	Design a precast prestressed inverted T–section to be used in a composite slab of total depth 600mm and width 300mm. the composite slab is required to support an imposed load of 16kN/m^2over a span of 14m. the compressive stress in concrete at transfer and the tensile stress under working loads may be assumed to be 20 and 1 N/mm^2 respectively. The loss ratio is 0.85. Determine the prestressing force required for the section.	Understand	CO 4	BSTB22.14
Part – C (Problem Solving and Critical Thinking)				
1	A composite T-girder of span 5 m is made up of a pre-tensioned rib, 100 mm wide by 200 mm depth, with an in situ cast slab, 400 mm wide and 40 mm thick. The rib is prestressed by a straight cable having an eccentricity of 33.33 mm and carrying initial force of, 150 kN. The loss of prestress is 15%. Check the composite T-beam for the limit state of deflection if its supports an imposed load of 3.2 kN/m for (i) unpropped(ii) propped. Assume modulus of Elasticity of 35kN/mm2 for both precast & in-situ cast elements.	Understand	CO 4	BSTB22.14
2	A PSC beam of cross section 150 mm x 300 mm is SS over a 6pan of 8m and is prestressed by means of symmetric parabolic cables @ a distance of 76 mm from the soffit @ mid span and 125 mm @ top @ support section. If the force in the cable i.e 350 KN. Calculate deflection @ midspan the beam is supporting its own weight The point load which must be applied at midspan to restore the beam to the level of its support	Understand	CO 4	BSTB22.13
3	A PSC beam with rectangular section, 150mm wide 300mm deep is prestressed by three cables each carrying a effective prestress of 200kN. The span of the beam is 12m. The first cable is parabolic with an eccentricity of 50m below the centroidal axis at the centre of the span and 50mm above the centroidal axis at the supports. The second cable is parabolic with an eccentricity of 50mm at the centre of the span and zero eccentricity at the supports. The third cable is straight with an eccentricity of 50mm below the centroidalaxis. If the beam supports an UDL of 6kN/m and Ec=38kN/mm^2 Estimate the instantaneous deflection for the following stages (i) Prestress + self weight of the beam. (ii) Prestress + self weight of the beam + live load.	Understand	CO 4	BSTB22.14

4	A prestressed concrete beam of span 8 m having a rectangular section 150 mm x 300 mm. the beam is prestressed by a parabolic cable having an eccentricity of 75 mm below the centroid axis at the centre of span and an eccentricity of 25 mm above the centroid axis at support section. The initial force in the cable is 350 KN. The beam support three concentrated loads of 10 kN each at intervals of 2 Es = 38 kN/mm^2. Neglecting losses of prestress, estimate the short term deflection due to(prestress+ self weight) Allowing for 20 % loss in prestress, estimate long term deflection under (prestress + self weight +live load), assume creep co-efficient as 1.8.	Understand	CO 4	BSTB22.13
5	A prestressed beam with rectangular cross section with a width of 120mm and depth of 300mm is continuous over two spans AB=BC=8m. The cable with zero eccentricity at the ends and an eccentricity of 50mm towards the top fibres of the beam over the central support carries an effective force of 500kN.	Understand	CO 4	BSTB22.14
6	A continuous beam ABC (AB=BC=10m) is prestressed by a parabolic cable carrying an effective force of 200kN. The cable profile is shown in Fig. The beam supports dead load and live load of 0.24kN/m and 2.36kN/m respectively. Calculate the resultant moments developed in the beam and locate the pressure line.	Understand	CO 4	BSTB22.14
7	A precast pre-tensioned beam of rectangular section has a breadth of 100mm and a depth of 200mm. the beam with an effective span of 5 m is prestressed by tendons with their centroids coinciding with the bottom kern. The initial force in the tendons is 150kN. The loss of prestress may be assumed to be 15 percent. The beam is incorporated in a composite T – beam by casting a top flange of breadth 400 mm and thickness 40 mm. if the composite beam supports a live load of 8kN/m^2. Calculate the resultant stresses developed in the precast and in-situ concrete assuming the pre-tensioned beam as: (a) Unpropped, (b) propped during the casting of the slab. Assume the same modulus of elasticity for concrete in precast beam and in-situ cast slab.	Understand	CO 4	BSTB22.14
8	A composite beam of rectangular section is made up of a pretensioned inverted T-beam having a thick slab of 150mm and width of 1000mm.The rib size is 150mm×850mm. the cast in-situ concrete has a thickness and width of 1000mm with a modulus of elasticity of 30kN/mm^2. If the differential shrinkage is 100x10^{-6} units, estimate the shrinkage stresses developed in the precast and cast in-situ units.	Understand	CO 4	BSTB22.14
9	A precast PSC beam of rectangular section has a breadth of 100 mm and a depth of 200 mm. The beam with an effective span of 5 m is prestressed by tendons with their centroids coinciding with bottom kern. The initial force in the tendon is 150 kN. The loss ratio = 0.85. The beam is incorporated in a composite T beam by casting a top flange of breadth 400 mm and thickness 40 mm. If the composite beam supports a live load of 8 kN/m^2. Calculate the resultant stresses developed in the precast and insitu cast concrete assuming the pretensioned beam as unpropped during the casting of the slab. Precastpsc = 35 kN/mm^2, Einsitu con = 28 kN/mm^2.	Understand	CO 4	BSTB22.14
10	Design a composite PSC beam for the following data: Span=12m; live load = 5kN/m^2; ó$_{ci}$ = 14 N/mm^2; ç =85%; Depth of the slab =150mm; f_{pe}= 950 N/mm^2 ; m=0.6; spacing of beam= 3.5m; Breadth of the web = 150mm; b_f= 1500mm. Assume post tension.	Understand	CO 4	BSTB22.14
UNIT -V				
ANALYSIS AND DESIGN				
Part - A (Short Answer Questions)				
1	What are the types of pipes?	Remember	CO 5	BSTB22.17
2	What are the types of cylinder pipes?	Remember	CO 5	BSTB22.17
3	Define circular prestressing?	Remember	CO 5	BSTB22.17
4	What are the design criteria for prestressed concrete pipes?	Remember	CO 5	BSTB22.17
5	Define two stage constructions?	Remember	CO 5	BSTB22.17
6	What is the stress induced in concrete due to circular prestressing?	Remember	CO 5	BSTB22.17

7	How are sleepers prestressed?	Remember	CO 5	BSTB22.18
8	Define the losses of prestress?	Remember	CO 5	BSTB22.17
9	What are the types of prestressed concrete pipes	Remember	CO 5	BSTB22.17
10	What are the advantages of prestressing water tanks?	Remember	CO 5	BSTB22.17
11	Draw the neat sketches of arrangements of reinforcement of end blocks.	Remember	CO 5	BSTB22.17
12	Write the expression for the bursting tension in guyon's method.	Remember	CO 5	BSTB22.17
13	Define Guyon's method.	Remember	CO 5	BSTB22.17
14	List the method of investigation the anchorage zone stresses.	Remember	CO 5	BSTB22.19
15	Draw the neat sketches of arrangements of reinforcement of end blocks.	Remember	CO 5	BSTB22.20
16	Write the expression for the bursting tension in guyon's method.	Remember	CO 5	BSTB22.18
17	Define propped construction in composite PSC construction?	Remember	CO 5	BSTB22.19
18	Describe how to achieve compositeness between precast and cast in-situ part?	Remember	CO 5	BSTB22.20
19	List the effects of differential shrinkage in composite beams?	Understand	CO 5	BSTB22.17
20	Differentiate between propped and unpropped composite construction?	Understand	CO 5	BSTB22.18
Part - B (Long Answer Questions)				
1	Write the procedure for design of cylinder pipes ?	Understand	CO 5	BSTB22.17
2	Differentiate prestressed cylinder and non cylinder pipe?	Understand	CO 5	BSTB22.19
3	A prestressed cylinder pipe is to be designed using a steel cylinder of 1000 mm internal diameter and thickness 1.6 mm .A circumferential wire winding consists of a 4mm high tensile wires initially tensioned to a stress of 1000 N/mm^2.ultimate tensile strength of the wire = 1600 N/mm^2.Yield stress of the steel cylinder = 280 N/mm^2. Maximum permissible compressive stress in concrete at transfer is 14 N/mm^2 and no tensile stress are permitted under working pressure of 0.8N/mm^2.Determine the thickness of the concrete lining required , No.of times of circumferential wire winding and factor of safety against busting .Assume α_e =6.	Understand	CO 5	BSTB22.19
4	A non-cylinder prestressed concrete pipe of internal diameter 1000mm and thickness of concrete shell 75mm is required to convey water at a working pressure of 1.5 N/mm^2.The length of each pipe is 6 m. A maximum and minimum compressive stresses in concrete are 15 and 2 N/mm^2 .The loss ratio is 0.8 .Design the circumferential wire winding 5mm diameter stressed to 1000 N/mm^2.	Understand	CO 5	BSTB22.19
5	A non-cylinder prestressed concrete pipe of internal diameter 1000mm and thickness of concrete shell 75mm is required to convey water at a working pressure of 1.5 N/mm^2.The length of each pipe is 6 m. A maximum and minimum compressive stresses in concrete are 15 and 2 N/mm^2 .The loss ratio is 0.8.Design awszxz permissible tensile stress under the critical transient loading (wire rappling at spigot end) should not exceed 0.8 $\sqrt{f_{ci}}$. f_{ci}– cube strength of concrete at transfer = 40 N/mm^2.	Understand	CO 5	BSTB22.19
6	A non-cylinder prestressed concrete pipe of internal diameter 1000mm and thickness of concrete shell 75mm is required to convey water at a working pressure of 1.5 N/mm^2.The length of each pipe is 6 m. A maximum and minimum compressive stresses in concrete are 15 and 2 N/mm^2 .The loss ratio is 0.8.check for safety against longitudinal stresses that developed considering the pipe as a hollow circular beam.	Understand	CO 5	BSTB22.19
7	Design a non-cylinder prestressed concrete pipe of 610 mm internal diameter to withstand a working hydrostatic pressure of 1.05 N/ mm2.Using a 2.5 mm high tensile wire stressed to 1000 N/mm2 at transfer permissible max and min stresses.At transfer and service loads of 14 and 0.7 N/mm2.The loss ratio is 0.8calculate also the test pressure required to produce a tensile stress of 0.7N/mm2 in concrete when applied immediately after tensioninsg and also the winding stress in steel if ES =210 KN/mm2 Ec = 35 KN/mm2.	Understand	CO 5	BSTB22.19

8	Design a non-cylinder prestressed concrete pipe of 600 mm internal diameter to withstand a working hydrostatic pressure of 1.05 N/ mm^2.Using a 2.5 mm high tensile wire stressed to 1000 N/mm^2 at transfer permissible max and min stresses.At transfer and service loads of 14 and 0.7 N/mm^2.The loss ratio is 0.8calculate also the test pressure required to produce a tensile stress of 0.7N/mm^2 in concrete when applied immediately after tensioninsg and also the winding stress in steel if E_S =210 $KN/mm^2$$E_c$= 35 KN/mm^2.	Understand	CO 5	BSTB22.19
9	A pre-stressed cylinder pipe is to be designed using a steel cylinder of 1400 mm internal diameter and thickness 1.8 mm .A circumferential wire winding consists of a 6 mm high tensile wires initially tensioned to a stress of 1200 N/mm^2.ultimate tensile strength of the wire = 1800 N/mm^2.Yield stress of the steel cylinder = 280 N/mm^2. Maximum permissible compressive stress in concrete at transfer is 16 N/mm^2 and no tensile stress are permitted under working pressure of 0.9 N/mm^2.Determine the thickness of the concrete lining required , No. of times of circumferential wire winding and factor of safety against busting .Assume α_e =8.	Understand	CO 5	BSTB22.19
10	Design a non-cylinder pre-stressed concrete pipe of 500 mm internal diameter to With-stand a working hydrostatic pressure of 1.05 N/ mm^2.Using a 2.0 mm high wire stressed to 800 N/mm^2 at transfer permissible max and min stresses. At transfer and service loads of 12 and 0.6 N/mm^2.The loss ratio is 0.75. Calculate also the test pressure required to produce a tensile stress of 0.7N/mm^2 in concrete when applied immediately after tensioning and also the winding stress in steel if E_S =210 $KN/mm^2$$E_c$= 35 KN/mm^2.	Understand	CO 5	BSTB22.19
11	A pre-stressed cylinder pipe is to be designed using a steel cylinder of 1450 mm internal diameter and thickness 1.9 mm .A circumferential wire winding consists of a 6 mm high tensile wires initially tensioned to a stress of 1200 N/mm^2.ultimate tensile strength of the wire = 1800 N/mm^2.Yield stress of the steel cylinder = 280 N/mm^2. Maximum permissible compressive stress in concrete at transfer is 16 N/mm^2 and no tensile stress are permitted under working pressure of 0.9 N/mm^2.Determine the thickness of the concrete lining required , No. of times of circumferential wire winding and factor of safety against busting .Assume α_e =8.	Understand	CO 5	BSTB22.19
12	10. Design a non-cylinder pre-stressed concrete pipe of 525 mm internal diameter to With-stand a working hydrostatic pressure of 1.05 N/ mm^2.Using a 2.0 mm high wire stressed to 800 N/mm^2 at transfer permissible max and min stresses. At transfer and service loads of 12 and 0.6 N/mm^2.The loss ratio is 0.75. Calculate also the test pressure required to produce a tensile stress of 0.7N/mm^2 in concrete when applied immediately after tensioning and also the winding stress in steel if E_S =210 $KN/mm^2$$E_c$= 35 KN/mm^2.	Understand	CO 5	BSTB22.19
13	A pre-stressed cylinder pipe is to be designed using a steel cylinder of 1425 mm internal diameter and thickness 1.8 mm .A circumferential wire winding consists of a 6 mm high tensile wires initially tensioned to a stress of 1200 N/mm^2.ultimate tensile strength of the wire = 1800 N/mm^2.Yield stress of the steel cylinder = 280 N/mm^2. Maximum permissible compressive stress in concrete at transfer is 16 N/mm^2 and no tensile stress are permitted under working pressure of 0.9 N/mm^2.Determine the thickness of the concrete lining required , No. of times of circumferential wire winding and factor of safety against busting .Assume α_e =8.	Understand	CO 5	BSTB22.19
14	Design a non-cylinder pre-stressed concrete pipe of 500 mm internal diameter to With-stand a working hydrostatic pressure of 1.10 N/ mm^2.Using a 2.0 mm high wire stressed to 800 N/mm^2 at transfer permissible max and min stresses. At transfer and service loads of 12 and 0.6 N/mm^2.The loss ratio is 0.75. Calculate also the test pressure required to produce a tensile stress of 0.7N/mm^2 in concrete when applied immediately after tensioning and also the winding stress in steel if E_S =210 $KN/mm^2$$E_c$= 35 KN/mm^2.	Understand	CO 5	BSTB22.19

15	A pre-stressed cylinder pipe is to be designed using a steel cylinder of 1400 mm internal diameter and thickness 1.8 mm .A circumferential wire winding consists of a 6 mm high tensile wires initially tensioned to a stress of 1300 N/mm^2.ultimate tensile strength of the wire = 1800 N/mm^2.Yield stress of the steel cylinder = 280 N/mm^2. Maximum permissible compressive stress in concrete at transfer is 16 N/mm^2 and no tensile stress are permitted under working pressure of 0.9 N/mm^2.Determine the thickness of the concrete lining required , No. of times of circumferential wire winding and factor of safety against busting .Assume α_e =8.	Understand	CO 5	BSTB22.19
16	Design a non-cylinder pre-stressed concrete pipe of 500 mm internal diameter to With-stand a working hydrostatic pressure of 1.05 N/ mm^2.Using a 3.0 mm high wire stressed to 800 N/mm^2 at transfer permissible max and min stresses. At transfer and service loads of 12 and 0.6 N/mm^2.The loss ratio is 0.75. Calculate also the test pressure required to produce a tensile stress of 0.7N/mm^2 in concrete when applied immediately after tensioning and also the winding stress in steel if E_S =210 KN/mm^2E_c= 35 KN/mm^2.	Understand	CO 5	BSTB22.19
17	A pre-stressed cylinder pipe is to be designed using a steel cylinder of 1500 mm internal diameter and thickness 1.8 mm .A circumferential wire winding consists of a 6 mm high tensile wires initially tensioned to a stress of 1200 N/mm^2.ultimate tensile strength of the wire = 1825 N/mm^2.Yield stress of the steel cylinder = 280 N/mm^2. Maximum permissible compressive stress in concrete at transfer is 16 N/mm^2 and no tensile stress are permitted under working pressure of 0.9 N/mm^2.Determine the thickness of the concrete lining required , No. of times of circumferential wire winding and factor of safety against busting .Assume α_e =8.	Understand	CO 5	BSTB22.19
18	Design a non-cylinder pre-stressed concrete pipe of 500 mm internal diameter to With-stand a working hydrostatic pressure of 1.15 N/ mm^2.Using a 2.0 mm high wire stressed to 800 N/mm^2 at transfer permissible max and min stresses. At transfer and service loads of 12 and 0.6 N/mm^2.The loss ratio is 0.75. Calculate also the test pressure required to produce a tensile stress of 0.7N/mm^2 in concrete when applied immediately after tensioning and also the winding stress in steel if E_S =210 KN/mm^2E_c= 35 KN/mm^2.	Understand	CO 5	BSTB22.19
19	A pre-stressed cylinder pipe is to be designed using a steel cylinder of 1400 mm internal diameter and thickness 1.8 mm .A circumferential wire winding consists of a 7 mm high tensile wires initially tensioned to a stress of 1200 N/mm^2.ultimate tensile strength of the wire = 1800 N/mm^2.Yield stress of the steel cylinder = 280 N/mm^2. Maximum permissible compressive stress in concrete at transfer is 16 N/mm^2 and no tensile stress are permitted under working pressure of 0.9 N/mm^2.Determine the thickness of the concrete lining required , No. of times of circumferential wire winding and factor of safety against busting .Assume α_e =8.	Understand	CO 5	BSTB22.19
20	Design a non-cylinder pre-stressed concrete pipe of 600 mm internal diameter to With-stand a working hydrostatic pressure of 1.05 N/ mm^2.Using a 2.0 mm high wire stressed to 800 N/mm^2 at transfer permissible max and min stresses. At transfer and service loads of 12 and 0.6 N/mm^2.The loss ratio is 0.75. Calculate also the test pressure required to produce a tensile stress of 0.7N/mm^2 in concrete when applied immediately after tensioning and also the winding stress in steel if E_S =210 KN/mm^2E_c= 35 KN/mm^2.	Understand	CO 5	BSTB22.19
Part – C (Problem Solving and Critical Thinking)				
1	A non-cylinder prestressed concrete pipe of internal diameter 1000mm and thickness of concrete shell 80 mm is required to convey water at a working pressure of 1.5 N/mm^2.The length of each pipe is 6 m. A maximum and minimum compressive stresses in concrete are 15 and 2 N/ mm^2 .The loss ratio is 0.8 .Design the circumferential wire winding 5mm diameter stressed to 1000 N/mm^2.	Understand	CO 5	BSTB22.19

2	A non-cylinder prestressed concrete pipe of internal diameter 1000mm and thickness of concrete shell 75mm is required to convey water at a working pressure of 1.75 N/mm^2.The length of each pipe is 6 m. A maximum and minimum compressive stresses in concrete are 15 and 2 N/mm^2 .The loss ratio is 0.8.Design awszxz permissible tensile stress under the critical transient loading (wire rappling at spigot end) should not exceed 0.8 $\sqrt{f_{ci}}$. f_{ci}– cube strength of concrete at transfer = 40 N/mm^2.	Understand	CO 5	BSTB22.19
3	A non-cylinder prestressed concrete pipe of internal diameter 1000mm and thickness of concrete shell 75mm is required to convey water at a working pressure of 1.5 N/mm^2.The length of each pipe is 6 m. A maximum and minimum compressive stresses in concrete are 17 and 3N/ mm^2 .The loss ratio is 0.8.check for safety against longitudinal stresses that developed considering the pipe as a hollow circular beam.	Understand	CO 5	BSTB22.19
4	Design a non-cylinder prestressed concrete pipe of 610 mm internal diameter to withstand a working hydrostatic pressure of 1.05 N/ mm2.Using a 3.0 mm high tensile wire stressed to 1000 N/mm2 at transfer permissible max and min stresses.At transfer and service loads of 15 and 0.7 N/mm2.The loss ratio is 0.8calculate also the test pressure required to produce a tensile stress of 0.7N/mm2 in concrete when applied immediately after tensioninsg and also the winding stress in steel if ES =210 KN/mm2 Ec = 35 KN/mm2.	Understand	CO 5	BSTB22.19
5	Design a non-cylinder pre-stressed concrete pipe of 500 mm internal diameter to With-stand a working hydrostatic pressure of 1.05 N/ mm^2.Using a 2.0 mm high wire stressed to 800 N/mm^2 at transfer permissible max and min stresses. At transfer and service loads of 12 and 0.6 N/mm^2.The loss ratio is 0.75. Calculate also the test pressure required to produce a tensile stress of 0.7N/mm^2 in concrete when applied immediately after tensioning and also the winding stress in steel if E_S =210 KN/mm^2 E_c= 35 KN/mm^2.	Understand	CO 5	BSTB22.19
6	A pre-stressed cylinder pipe is to be designed using a steel cylinder of 1450 mm internal diameter and thickness 1.9 mm .A circumferential wire winding consists of a 6 mm high tensile wires initially tensioned to a stress of 1225 N/mm^2.ultimate tensile strength of the wire = 1800 N/mm^2.Yield stress of the steel cylinder = 280 N/mm^2. Maximum permissible compressive stress in concrete at transfer is 16 N/mm^2 and no tensile stress are permitted under working pressure of 0.9 N/mm^2.Determine the thickness of the concrete lining required , No. of times of circumferential wire winding and factor of safety against busting .Assume α_e =8.	Understand	CO 5	BSTB22.19
7	Design a non-cylinder pre-stressed concrete pipe of 525 mm internal diameter to With-stand a working hydrostatic pressure of 1.25 N/ mm^2.Using a 2.0 mm high wire stressed to 800 N/mm^2 at transfer permissible max and min stresses. At transfer and service loads of 12 and 0.6 N/mm^2.The loss ratio is 0.75. Calculate also the test pressure required to produce a tensile stress of 0.7N/mm^2 in concrete when applied immediately after tensioning and also the winding stress in steel if E_S =210 KN/mm^2 E_c= 35 KN/mm^2.	Understand	CO 5	BSTB22.20
8	A pre-stressed cylinder pipe is to be designed using a steel cylinder of 1425 mm internal diameter and thickness 1.9 mm .A circumferential wire winding consists of a 6 mm high tensile wires initially tensioned to a stress of 1200 N/mm^2.ultimate tensile strength of the wire = 1800 N/mm^2.Yield stress of the steel cylinder = 280 N/mm^2. Maximum permissible compressive stress in concrete at transfer is 16 N/mm^2 and no tensile stress are permitted under working pressure of 0.9 N/mm^2.Determine the thickness of the concrete lining required , No. of times of circumferential wire winding and factor of safety against busting .Assume α_e =8.	Understand	CO 5	BSTB22.19

9	Design a non-cylinder pre-stressed concrete pipe of 500 mm internal diameter to With-stand a working hydrostatic pressure of 1.05 N/ mm^2.Using a 2.5 mm high wire stressed to 800 N/mm^2 at transfer permissible max and min stresses. At transfer and service loads of 12 and 0.6 N/mm^2.The loss ratio is 0.75. Calculate also the test pressure required to produce a tensile stress of 0.7N/mm^2 in concrete when applied immediately after tensioning and also the winding stress in steel if E_S =210 KN/$mm^2$$E_c$= 35 KN/$mm^2$.	Understand	CO 5	BSTB22.19
10	A pre-stressed cylinder pipe is to be designed using a steel cylinder of 1500 mm internal diameter and thickness 1.9 mm .A circumferential wire winding consists of a 6 mm high tensile wires initially tensioned to a stress of 1200 N/mm^2.ultimate tensile strength of the wire = 1900 N/mm^2.Yield stress of the steel cylinder = 280 N/mm^2. Maximum permissible compressive stress in concrete at transfer is 16 N/mm^2 and no tensile stress are permitted under working pressure of 0.9 N/mm^2.Determine the thickness of the concrete lining required , No. of times of circumferential wire winding and factor of safety against busting .Assume α_e =8.	Understand	CO 5	BSTB22.19

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