

GUJARAT TECHNOLOGICAL UNIVERSITY

BE-7 SEMESTER – OLD PAPER – S22 TO S25 – QUESTION BANK

Subject Name & Code:

Design of Prestressed Concrete structures- 3170624

Unit 1: Introduction

Repeated Questions:

1. **Explain the basic concept of Prestressed Concrete.**
 - Appeared in: W23 (Q1a, 03 marks), S23 (Q1a, 03 marks), S25 (Q1b, 04 marks)
2. **State the advantages and disadvantages of Prestressed concrete.**
 - Appeared in: W22 (Q3a, 03 marks), S22 (Q1b, 04 marks), S23 (Q2b, 04 marks)
3. **What are the applications of prestressed concrete?**
 - Appeared in: W22 (Q1a, 03 marks)
4. **Differentiate between prestressed concrete and reinforced concrete.**
 - Appeared in: S25 (Q1a, 03 marks), W24 (OR Q3a, 03 marks)
5. **Define/Explain: Pre-tensioning, Post-tensioning, Tendon, Anchorage.**
 - Appeared in: W24 (Q1a, 03 marks), S25 (Q3b, 04 marks), S23 (Q5a, 03 marks), S23 (OR Q5a, 03 marks)

Other Important Questions:

1. **What is the need for the use of high strength concrete and tensile steel in prestressed concrete?** (W22 - Q1b, 04 marks)
2. **Justify the statement that the use of high-strength concrete and high-tensile steel is essential in prestressed concrete.** (S25 - OR Q5a, 03 marks)
3. **List the various types of tensioning devices used in prestressed concrete.** (W23 - Q1b, 04 marks), (S22 - Q3a, 03 marks), (W24 - Q1b, 04 marks)
4. **Briefly explain various types of tensioning devices used in prestressed concrete.** (W23 - Q1b, 04 marks)
5. **Explain the Post-tensioned method of prestressing concrete.** (S25 - Q2a, 03 marks)
6. **Define: Bonded Prestressed Concrete, Degree of Prestressing.** (W24 - Q2a, 03 marks), (S23 - OR Q5a, 03 marks)
7. **Define: Circular Prestressing, Eccentric Prestressing, Partial Prestressing.** (S25 - Q3b, 04 marks)
8. **What is non-distortional prestressing?** (W24 - OR Q5b, 03 marks)

Unit 2: Losses in Prestress

Repeated Questions:

1. **List the various types of loss of prestress in pre-tensioned and post-tensioned members.**
 - Appeared in: W23 (Q2a, 03 marks), S22 (Q2a, 03 marks)
2. **Distinguish between creep and shrinkage.**
 - Appeared in: W22 (Q5a, 03 marks), S23 (Q2a, 03 marks), S25 (Q2b, 04 marks)
3. **Explain the various losses of prestress in post-tensioned members.**
 - Appeared in: S23 (Q1b, 04 marks)
4. **Explain transmission length in pre-tensioned members.**
 - Appeared in: S22 (Q5a, 03 marks), S23 (Q5b, 04 marks)
5. **What is anchorage slip? How do you compute the loss of stress due to anchorage slip?**
 - Appeared in: S23 (Q3b, 04 marks), W24 (OR Q5c, 07 marks)

Other Important Questions:

1. **Define the losses present in post-tensioned member?** (W22 - Q2a, 03 marks)
2. **Define transmission length, and what is expression of it as per IS 1343 (2012) recommendations.** (W22 - Q5b, 04 marks), (W24 - Q4a, 03 marks)
3. **Enlist the formula for calculating losses due to Elastic deformation and Friction.** (W24 - Q2b, 04 marks)
4. **Explain the difference between Immediate and Time-dependent losses in Prestressed concrete sections.** (S22 - OR Q3a, 03 marks)
5. **Enlist difference between time dependent and immediate losses.** (W24 - Q5a, 03 marks)
6. **What is creep in prestressed concrete? What are the factors that affect creep of concrete?** (S22 - OR Q5a, 03 marks), (S23 - Q4a, 03 marks), (S23 - OR Q4b, 04 marks)

Numerical Problems on Losses:

1. **A rectangular concrete beam... calculate the percentage loss of stress in steel immediately after transfer, allowing for the loss of stress due to elastic deformation of concrete only.** (S22 - Q1c, 07 marks) *[Similar numerical in W23-Q1c, S23-Q2c, S25-Q2c]*
2. **A pretensioned beam 250 mm wide and 360 mm deep is prestressed by 10 wires of 8 mm dia... Find the final percentage of loss of stress in steel wires.** (W22 - Q2c, 07 marks)
3. **A concrete beam is prestressed by a cable... Calculate the percentage loss of stress in the cable only due to shrinkage of concrete...** (S23 - OR Q2c, 07 marks)
4. **A post-tensioned concrete beam of rectangular section... compute the loss of stress in steel only due to creep of concrete.** (S23 - Q1c, 07 marks)
5. **A prestressed concrete beam 100 mm x 300 mm is post tensioned by parabolic cable... Estimate the loss of prestress in cable due to the creep of concrete.** (S25 - OR Q2c, 07 marks)

Unit 3: Flexural Design of Prestressed Concrete Elements

Repeated Questions:

1. **Explain the different modes of flexural failure observed in prestressed concrete beams?**
 - Appeared in: W22 (Q4b, 04 marks), S22 (Q4b, 04 marks), S23 (Q3a, 03 marks)
2. **Explain the concept of pressure (thrust) line.**
 - Appeared in: W22 (Q2b, 04 marks), W23 (Q3a, 03 marks), W24 (Q4b, 03 marks)
3. **State the assumptions made in the design of prestressed concrete members for the limit state of collapse in flexure.**
 - Appeared in: S22 (Q3b, 04 marks), S23 (OR Q5b, 04 marks)
4. **Enlist the assumptions of the Strain compatibility method.**
 - Appeared in: S25 (Q3a, 03 marks), W24 (Q3a, 03 marks), S23 (OR Q4a, 03 marks)
5. **Explain the concept of load balancing.**
 - Appeared in: W23 (Q4a, 03 marks), S22 (Q4a, 03 marks)

Other Important Questions:

1. **Write about pressure line concept.** (W22 - Q2b, 04 marks)
2. **Briefly explain Strain Compatibility method.** (W23 - OR Q3b, 04 marks)
3. **Discuss IS 1343 recommendations for design of prestressed members subjected to bending and torsion.** (W22 - Q3a, 03 marks), (W23 - OR Q3a, 03 marks), (W24 - Q3b, 04 marks)
4. **What is effective reinforcement ratio? In what way it influence the stress in tendons and the neutral axis depth at the limit state of collapse?** (W24 - OR Q4c, 07 marks)
5. **Explain the concordant profile.** (W24 - OR Q4b, 03 marks)
6. **List the factors influencing the short term and long term deflections of prestressed concrete members.** (W22 - Q3b, 04 marks)
7. **State the four fundamental conditions for stresses at transfer and service stage.** (S22 - Q5b, 04 marks)
8. **State the maximum permissible compressive stress in flexure at the transfer stage and service stage.** (S22 - OR Q3b, 04 marks)
9. **Discuss the maximum allowable compressive stress limits in flexure due to prestressing at both the service stage and transfer stage...** (S25 - Q5b, 04 marks)
10. **Explain stress distribution in the end block in the prestressed concrete beam.** (S22 - Q5c, 07 marks)
11. **Under what situations and type of structures would you recommend the use of unbonded tendons?** (S23 - OR Q3a, 03 marks)

Numerical Problems on Flexure & Design:

1. **A PSC beam of 230 mm wide and 450 mm deep... Determine the location of the pressure line in beam at centre, quarter & support sections.** (W22 - OR Q2c, 07 marks) *[Similar numerical in W23-Q2c, S23-Q4c]*
2. **An unsymmetrical I section... Determine P and e to resist self weight and applied moment...** (W22 - Q3c, 07 marks) *[Similar numerical in S23-OR Q3c]*
3. **A pretensioned, T-section... calculate the flexural strength of the T-section.** (W23 - Q3c, 07 marks) *[Similar numerical in S23-Q5c, S25-Q3c, S25-OR Q3c, W24-Q5c]*
4. **A post-tensioned beam with unbonded tendons... estimate the ultimate moment of resistance of the section...** (W23 - OR Q3c, 07 marks)

5. **A bonded prestressed concrete beam... Estimate the ultimate moment capacity of section using IS 1343 (2012) recommendations.** (S22 - Q4c, 07 marks) *[Similar numerical in S23-OR Q4c]*
6. **A concrete beam with a single overhang... Determine the profile of prestressing cable... which can balance dead load and live load.** (W24 - Q3c, 07 marks)
7. **A PSC beam of span 8m has the following data... Determine the deflection for the following cases...** (S23 - OR Q5c, 07 marks) *[Similar numerical in W22-Q1c]*

Unit 4: Shear and Torsional Strength Design

Repeated Questions:

1. **Distinguish between web shear, flexural and flexure-shear cracks in concrete beams with sketches.**
 - Appeared in: W22 (Q5b, 04 marks), S23 (Q4b, 04 marks), W24 (Q5b, 04 marks)
2. **Discuss IS 1343 recommendations for design of prestressed members subjected to shear.**
 - Appeared in: S22 (OR Q5b, 04 marks), W24 (OR Q4a, 03 marks)

Other Important Questions:

1. **Explain failure due to web-shear cracks with neat sketch.** (W23 - Q4a, 03 marks)
2. **What are the different ways of improving the shear resistance of structural concrete members by prestressing techniques?** (W23 - Q4b, 04 marks)
3. **Explain failure due to flexure-shear cracks with neat sketch.** (W23 - OR Q4a, 03 marks)
4. **Explain web shear cracks with neat sketch Discuss briefly the basic of Indian standard IS: 1343 code recommendations regarding the design of prestressed section subjected to shear.** (W23 - OR Q4b, 04 marks)
5. **Explain flexural, flexural-shear, and web shear cracks in the concrete beam with the sketches.** (S25 - Q4a, 03 marks)
6. **Explain the various modes of failure that are encountered in prestressed concrete beams subjected to bending moment, shear force, and torsion simultaneously.** (S25 - OR Q4a, 03 marks)
7. **Write a note on the computation of the ultimate shear resistance of the prestressed concrete section when the section is cracked, and uncracked in flexure.** (S25 - OR Q4b, 04 marks)
8. **Explain the provision of the design of shear reinforcement as per the IS: 1343-2012.** (S25 - Q4c, 07 marks)
9. **Explain the reinforcement provisions for resisting combined shear, torsion, and bending stresses in prestressed concrete according to IS: 1343-2012.** (S25 - OR Q4c, 07 marks)

Numerical Problems on Shear & Torsion:

1. **A post-tensioned bonded prestressed concrete beam... design suitable longitudinal reinforcements in the beam... based on the skew bending approach.** (W23 - Q4c, 07 marks)
2. **The support section of a prestressed concrete beam... design suitable reinforcements at the section using the IS: 1343 recommendations.** (W23 - OR Q4c, 07 marks)
3. **A prestressed concrete beam spans 10 m... Compare the magnitude of the principal tensile stress in the beam with and without axial prestress.** (S25 - Q4b, 07 marks)

Unit 5: Prestressed Compression and Tension Members & Misc. Topics

Repeated Questions:

1. **Enlist various loads acting on bridges.**
 - Appeared in: W22 (Q5a, 03 marks), W23 (Q5a, 03 marks)
2. **Compute the bursting force and Design suitable anchorage zone reinforcement according IS 1343.**
 - Appeared in: W22 (Q5c, 07 marks), S22 (Q5c, 07 marks)

Other Important Questions:

1. **Write a detail note on Bursting tensile forces according to IS 1343.** (W23 - Q5b, 04 marks)
2. **Explain the provisions for bursting tensile force and bearing stress for prestressed concrete sections as per the IS: 1343: 2012.** (S25 - OR Q3b, 04 marks)
3. **Explain various types of prestressed compression members.** (W23 - OR Q5a, 03 marks)
4. **Enlist various tension members of prestressed concrete and explain the elastic design of prestressed tension member.** (S25 - Q5a, 03 marks)
5. **Describe composite prestressed construction and its advantages.** (S25 - Q5c, 07 marks)
6. **Enlist the advantages of composite construction with prestressed and in situ concrete for structural members.** (W24 - OR Q2c, 07 marks)
7. **Describe the stresses that occur in a short prestressed concrete column during the transfer stage and under service conditions.** (S25 - OR Q5b, 04 marks)
8. **Briefly explain IS 1343 codal provision for limit state of serviceability for Maximum Compression.** (W23 - OR Q5b, 04 marks)

Numerical Problems on End Blocks & Bridges:

1. **The end block of a post-tensioned prestressed member... Design suitable anchorages for the end block.** (W23 - Q5c, 07 marks)
2. **The end block of a post-tensioned prestressed concrete beam... Design and detail the anchorage reinforcement for the end block.** (W23 - OR Q5c, 07 marks)
3. **The floor slab for an auditorium of span 10m is to be designed as a one-way prestressed concrete slab... Design the suitable thickness for the slab and estimate the maximum horizontal spacing of the cables...** (S22 - Q4c, 07 marks) *[Similar numerical in W22-Q5c]*
4. **A simply supported prestressed concrete beam with 10 m span... Find top and bottom fibre stresses at transfer and after application of live load... Draw stress distribution diagram...** (S25 - OR Q5c, 07 marks)
5. **A box girder of pre-stressed concrete bridge of span 40m... Compute the resultant stresses at centre of span section using the internal resisting couple method.** (W22 - Q3c, 07 marks)
