

Module-3

- 5 a. What are the different flexural failure modes observed in prestressed concrete beam? Explain with sketches. (06 Marks)
- b. A post tensioned bridge girder with unbounded tendons is of box section of overall dimensions 1200mm wide \times 1800mm deep with wall thickness 150mm. The high tensile steel has an area of 4000mm² and is located at an effective depth of 1600mm. The effective prestress in steel after all losses is 1000N/mm² and the effective span of the girder is 24m. If $f_{ck} = 40\text{N/mm}^2$ and $f_p = 1600\text{N/mm}^2$, estimate the ultimate flexural strength of the section. (10 Marks)
- 6 Design a post tensioned prestressed concrete roof girder to suit the following data:
 Effective span = 20m
 Live load = 12kN/m
 $f_{ck} = 50\text{N/mm}^2$
 $f_{ct} = 41\text{N/mm}^2$
 lose ratio = 0.85
 Cable containing 12 wires of 7mm diameter ($f_p = 1500\text{N/mm}^2$) are available for use. Design the girder as Type-1 member to confirm IS1343. (16 Marks)

Module-4

- 7 a. Explain different methods of improving shear resistance of PSC members. (06 Marks)
- b. A prestressed girder of rectangular section 150mm wide shear force of 130kN. The uniform prestress across the section is 5N/mm². Given the characteristic strength (cube) strength of concrete is 40N/mm² and Fe-415 HYSD bars of 8mm diameter, design suitable spacing for the stirrups confirming to Indian standard code IS-1343 recommendations. Assume cover to the reinforcement as 50mm. (10 Marks)
- 8 a. Explain mechanism of shear failure in PSC beams. (06 Marks)
- b. The horizontal prestress at the centroid of a concrete beam of rectangular section 120mm \times 250mm is 7N/mm² and the maximum shearing force on the beam is 70kN. Calculate the maximum principal tensile stress, what is the maximum vertical stress required to eliminate this principal stress? (10 Marks)

Module-5

- 9 a. Write a note on zone stresses. (06 Marks)
- b. The end block of a prestressed concrete girder is 200mm wide \times 300mm deep. The beam is post tensioned by two Freyssinet anchorage each of 100mm diameter with their centres located at 75mm from top and bottom of beam. The force transmitted by each anchorage being 2000kN. Compute the bursting force and design suitable reinforcements according to IS1343, sketch the arrangement of anchorage zone reinforcement. (10 Marks)
- 10 The mid section of a composite T beam comprises a pretensioned beam 300mm wide and 900mm deep and an in-situ cast slab 900mm wide and 150mm deep. The effective prestressing located 200mm from the soffit of the beam is 2180kN. The moment due to the weight of the precast section is 273kN-m at mid span. After this is erected in place, the top slab is cast producing a moment of 136.5kN-m at midspan. After the slab concrete is hardened, the composite section is to carry a maximum live load moment of 750kN-m. Compute the resultant final stresses at
 i) The top of slab
 ii) The top and bottom of precast section. (16 Marks)
