

Sub Code:MSCT-311

ROLL NO.....

**SEMESTER EXAMINATION, 2022-23
YEAR**

Programme – Ist Yr. M.Tech – STRUCTURE ENGINEERING

DESIGN OF PRE-STRESSED CONCRETE STRUCTURE

Duration : 3:00 hrs

Max Marks: 100

Note:-Attempt all questions. All Question carry equal marks. In case of any ambiguity or missing data, the same may be assumed and state the assumption mad in the answer.

Q 1. Answer any four parts of the following.

- a) What is axial pre-stressing.
- b) What is the formula for finding the resultant stress of PSC beam.
- c) In a PSC beam, which section will have maximum eccentricity? Give explanation.
- d) What is differential shrinkage in PSC composite members.
- e) What are the various methods involved in determining the anchorage zone stresses.
- f) What is the formula for maximum shear stress of T-section due to torsion.

Q 2. Answer any four parts of the following.

- a) What are the ways of improving shear resistance in PSC members.
- b) Write about bi-axial pre-stressing.
- c) State two factors influencing loss of stress due to creep of concrete.
- d) Define limiting zone for PSC force.
- e) For M 25 & 30 concrete grade what is the allowable flexural stress.
- f) Discuss in detail the steps required to find the shear and principal stresses due to torsion.

Q 3. Answer any two parts of the following.

- a) What is torsion in PSC members? Discuss pure torsion in detail.

b) Explain in detail the requirements of concrete used in PSC members.

c) Evaluate the ultimate moment capacity of a section 300 x 600 mm with 1000 mm² of high tensile steel of 150 mm from bottom. Prestressing force of 1000 kN is transmitted to the cross section after losses. The strength of the concrete is 40 N/ mm² and steel has a capacity of $f_p = 1380$ N/ mm² and $f_{pu} = 1200$ N/ mm².

Q 4. Answer any two parts of the following.

a) Explain load balancing concept applied to analyse basic behavior of prestressed concrete.

b) Define type – I, type – II and type – III structures.

c) Design a prestressed concrete beam of rectangular section for a span of 3 m. It is to be designed to support two imposed loads of 3.5 kN each located at one third points over the span. There is to be no tensile stresses in concrete at transfer and service load conditions.

Q 5. Answer any two parts of the following.

a) A continuous beam ABC (AB=BC=20m) with an overall depth of 1000mm is prestressed by continuous cable carrying a force of 300 kN. The cable profile is parabolic between supports with zero eccentricity at ends A and C.

The cable has an eccentricity of 100 mm towards the soffit at midspan sections and 200mm towards the top fibre at mid support section. Calculate the reactions developed at supports due to prestress and show that the cable is concordant.

b) The support section of a prestressed concrete beam 100 mm wide and 250 mm deep, is required to support an ultimate shear force of 60 kN. The compressive prestress at the centroidal axis is 5 N/ mm² . $f_{ck} = 40$ N/ mm² . Cover to tension reinforcement is 50 mm. $f_y = 250$ N/ mm² . Design the suitable reinforcements at the section using IS: 1343 code provisions.

c) Discuss the steps involved in designing the shear reinforcements according to IS 1343 with appropriate formulas.