M.Tech. 1st Semester (Civil Engg.)

Examination, December–2018

SPECILISATION IN STRUCTURAL DESIGN

Paper– MTSD–103

Pre- Stressed Concrete Design

Time allowed : 3 hours] *[Maximum marks : 100*

Note: *Attempt any **five** full questions all question carry equal marks, Assume Suitable Data if not Provided use of relevant code is allowed.*

1. (a) State advantages and disadvantages of pre stressed concrete members over reinforced concrete members. 10

(b) A Pre stressed concrete beam of section 150 mm wide and 350 mm deep is used on effective span of 6 meter to support a uniformly distributed load of 6 kN / M which includes the self weight of the beam. The beam is pre stressed by a straight cable carrying a force of 200 KN and located at an eccentricity of 50 mm. Determine the location of thrust Line in the beam and plot its position quarter and central span section. 10

2. (a) Explain the concept of load balancing in pre stressed concrete members. 8

(b) Briefly explain the relation between tendon profiles and equivalent load in pre stressed concrete beam with example. 12

3. (a) A concrete beam supports three concentrated load equally spaced on the simply supported span. Suggest a suitable cable profile to counteract the effect of these live loads. 8

(b) What is high strength concrete? Explain its short term and long term properties. 12

4. (a) Write a brief note on the various materials for pre stressed concrete. 10

(b) A concrete beam of rectangular cross section 350 mm by 650 mm deep supports an uniformly distributed load of 25 kN/m in addition to its self weight. Suggest a suitable cable profile and the pre stressing force having an eccentricity of 180 mm, at the centre of the span to support the dead and live load. 10

5. (a) A rectangular concrete beam of cross section 120 mm wide and 300 mm deep is pre stressed by a straight cable carrying an effective force of 180 kN at an eccentricity of 50 mm. The beam supports an imposed load of 3.14 kN/m over a span of 6 meter. If the modulus of rupture of concrete is 5 N/ mm^2. Calculate the load factor against cracking. 12

(b) What is relaxation of stress in steel? How do you account for it in members? Explain the provision made in IS 1343 for relaxation loss. 8

6. A pre stressed concrete beam with a cross section of

120 mm wide and 300 mm deep is used to support a uniformly distributed live load of 3 kN/m over an effective span of 6 m. The beam is pre stressed by a straight cable carrying an effective pre stressing force of 180 kN at a constant eccentricity of 50 mm. given Ec = 38 kN/ mm^2, The Modulus of rupture = 5 N / Mm^2, area of the cable = 200 mm^2 and modulus ratio = 6, estimate the deflection of the beam for working load. 20

7. (a) Distinguish between web shear, flexure and flexure shear cracks in concrete beam with example. 10

(b) What is the effect of the torsion on pre stressed concrete section? How do you compute the shear stress developed in different types of cross-section due to torque? 10

8. The horizontal pressure at the centeroid of a concrete beam of rectangular cross-section, 120 mm by 250 mm is 7 N/ mm^2 and the maximum shearing force on the beam is 70 kN. Calculate the Maximum Principal tensile stress. What is the minimum vertical pre stresses required to eliminate the principal tensile stress? 20