

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VIII(NEW) EXAMINATION – SUMMER 2019****Subject Code:2180612****Date:13/05/2019****Subject Name:Design Of Prestressed Concrete Structures & Bridges****Time:10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of code IS: 1343 (2012) is permitted.

- Q.1** (a) Define (1) Post-tensioning (2) Bonded Prestressed Concrete (3) Degree of Prestressing. **03**
- (b) What are different principles of post tensioning and applications of post tensioning? **04**
- (c) A live load of 2kN/m is imposed on an unsymmetrical I section beam with 300mm wide and 60 mm thick top flange, 100mm wide and 60mm thick bottom flange and 80 mm thick and 280 mm long web. The effective prestressing force of 100kN is located at 50mm from the bottom of the beam and at the center of the span. Consider length of span as 7m. Calculate the stresses at the center of the span section of the beam for the following load conditions:
a) Prestress + self-weight.
b) Prestress +self-weight +live load. **07**
- Q.2** (a) What are different types of losses of prestress in pretensioning and post-tensioning? **03**
- (b) Explain the concept of thrust line and how it is located. **04**
- (c) A rectangular concrete beam 120 mm wide and 300 mm deep is used over an effective span of 6m to support a uniformly distributed load of 4kN/m including the self-weight of the beam. It is prestressed by a straight cable carrying a force of 180kN and located at an eccentricity of 50mm. determine the location of thrust line in the beam and plot its position at quarter and central span sections. **07**
- OR**
- (c) A rectangular beam 300mm wide and 800mm deep supports two concentrated loads of 20kN each at the third point of span of 9m. if the eccentricity of the trapezoidal cable profile is 100mm for the middle third portion of the beam, calculate the prestressing force required to balance the bending effect of the concentrated load neglecting the self-weight of the beam. If the resultant stress due to self-weight, imposed loads and prestressing force is zero at bottom fibre of the mid span section, calculate the effective force in the cable. Consider same cable profile and density of concrete as 24kN/m² **07**
- Q.3** (a) Define transmission length and how can we calculate it? **03**
- (b) How straight and trapezoidal tendon profiles affect deflections? **04**
- (c) A pretensioned T section has a flange 1200mm wide and 150mm thick. The width and depth of the rib are 300mm and 1500mm respectively. The high tensile steel has an area of 4700mm² and is located at an effective depth of 1600mm. calculate the flexural strength of T section. (Assume $f_{ck} = 40\text{N/mm}^2$, $f_p = 1600\text{N/mm}^2$ and use IS Code method) **07**
- OR**
- Q.3** (a) Enlist different types of flexural failure and explain any one. **03**
- (b) Briefly discuss IS 1343 recommendations for design of prestressed members subjected to shear, torsion and bending. **04**

- (c) A prestressed concrete pile, 250 mm square contains 60 pre-tensioned wires each of 2 mm diameter uniformly distributed over the section. the wires are initially tensioned on the prestressing bed with a total force of 300kN. Calculate the final stress in concrete and the percentage loss of stress in steel after all losses, Given the following data $E_s=210\text{kN/mm}^2$, $E_c=32\text{kN/mm}^2$, Shortening due to creep $=30 \times 10^{-6}$ mm/mm per N/mm^2 of stress, total shrinkage $=200 \times 10^{-6}$ per unit length, Relaxation of steel stress $=5\%$ of initial stress. **07**
- Q.4 (a)** Explain in details the Live load specification for road bridge as per IRC. **03**
- (b)** What is strain compatibility method? **04**
- (c)** The deck slab of a road bridge of span 10m is to be designed as a one way prestressed concrete slab, with parallel post-tensioned cables in each of which the force at transfer is 500 kN. If the deck slab is required to support a uniformly distributed live load of 25 kN/m^2 , with compressive and tensile stress in concrete at any stage not exceeding 15 and zero N/mm^2 respectively, calculate the maximum horizontal spacing of the cables and their positions at the mid-span section. assume the loss ratio as 0.80. **.07**
- OR**
- Q.4 (a)** Write in brief investigation and planning to be carried out for bridge design and construction **03**
- (b)** How do you Compute the loss of stress due to elastic deformation of concrete? **04**
- (c)** What are the salient design features of prestressed concrete one way and two way slab panels? **07**
- Q.5 (a)** Explain Courbon's Method for Load distribution on bridge deck. **03**
- (b)** Give classification of bridges based on various aspects. **04**
- (c)** Explain role of pier as a substructure part of Bridges. Also enlist the loads and forces to be considered while designing pier **07**
- OR**
- Q.5 (a)** Enlist loads acting on bridges. **03**
- (b)** Give classification of bridges based on various aspects. **04**
- (c)** Which are the preliminary data to be collected for the design of bridges? **07**
