Roll No. | | | | | | | | | | | | | Total No. of Pages : 03

Total No. of Questions : 18

B.Tech. (CE) (2012 to 2017) (Sem.–7)

# PRE-STRESSED CONCRETE

Subject Code : BTCE-809

M.Code : 71868

Time : 3 Hrs. Max. Marks : 60

**INSTRUCTION TO CANDIDATES :**

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**
4. **Use of IS 1343 is permitted in the examination.**

## SECTION-A

**Answer briefly :**

1. Give the range of w/c ratio of High strength mixes.
2. What is the necessity of using high strength concrete in prestressed concrete?
3. Define shrinkage of concrete.
4. What is Pressure Line?
5. What is Anchorage slip?
6. What is the limiting value of effective reinforcement ratio of a bonded prestressed concrete beam at failure?
7. Name two ways of improving the shear resistance of structural concrete members by prestressing concrete.
8. Give any empirical formula for computing transmission length.
9. What is the advantage of prestressing grid floors?
10. What is debonding?

## SECTION-B

11. What are Tendon splices? Sketch some common types of tendon splices.

12. A prestressed concrete pile 250 mm square, contains 60 pretensioned wires, each of 2mm diameter, uniformly distributed over the section. The wires are initially tensioned on the prestressing bed with a total force of 300 kN. Calculate the final stress in concrete and the percentage loss of steel after all losses. Data given is modular ratio = 6.5, shrinkage due to creep = $30 \times 10^{-6}$ mm/mm per N/mm$^2$, relaxation of steel stress = 5% of Initial stress.

13. A prestressed concrete beam of rectangular section 120mm wide and 300 mm deep spans over 6m. The beam is prestressed by a straight cable carrying an effective force of 200 kN at an eccentricity of 50 mm. It supports an imposed load of 4kN/m and $E_C$ = 40 kN/mm$^2$.

    Compute the deflection at the following stages :

    a) Upward deflection under prestress + Self weight.

    b) Final deflection under prestress + SWT + Imposed load including effects of creep & Shrinkage.

14. A post-tensioned prestressed concrete T beam having a flange width of 1200 mm and flange thickness of 200 mm, thickness of web = 300 mm is prestressed by 2000 mm$^2$ of high tensile steel located at an effective depth of 1600 mm. If $fck$ = 40 MPa, $fp$ = 1600 MPa ; estimate the ultimate flexural strength of unbounded Tee section, assuming span/depth ratio as 20 and $fpe$ = 1000 MPa.

15. Explain with sketches the effect of varying the ratio of depth anchorage to the depth of end block on the distribution of bursting section.

## SECTION-C

16. Design a partially prestressed post-tensioned beam to suit the following data :

    Effective span = 30 m

    Live Load = 9 kN/m

    Dead load (excluding self weight) = 1 kN/m

    Load factors : 1.4 for DL & 1.6 for LL.

    $f_{cu}$ = 50 MPa

    Strength of concrete at transfer = 35 MPa

    Loss Ratio $u$ = 0.85

    Tensile strength of concrete = 1.7 N/mm$^2$

    Permissible tensile stress under service loads = 6 N/mm$^2$

    Maximum width of crack under service loads not to exceed 0.1 mm.

    8mm $\phi$ high tensile wires having an ultimate tensile strength of 1500 MPa are available for use.

17. Design a post tensioned prestressed concrete two way slab 6m by 8m in size, to support a live load of 3kN/$m^2$. If cables of four wires of 5mm diameter stressed to 1000 N/$mm^2$ are available for use, determine the number of cables in the two principle directions. The stresses in concrete not to exceed 15 MPa in compression and tensile stresses are not permitted under service loads. The loss ratio is 0.7.

    Check for limit states of service ability and collapse.

18. Write short notes on :

    a) Shear and Principle stresses due to torsion

    b) Methods by which bond between concrete and steel tendons can be improved.



**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**