Paper Code: STR-21	**Roll No.**									

M.Tech.
(SEM-II) EXAMINATION, 2015-16
ADVANCED STRUCTURAL DESIGN

Time: 3 Hours **Total Marks: 100**

Note: (i) Attempt ALL questions.
(ii) Marks are indicated against each question.
(iii) Assume any data suitably, if required.
(iv) **IS 456: 2000 and IS: 1343** is permitted.

1. Attempt any **Two** parts of the following:- [**10x2=20]**

(a) Differentiate between low, medium and high strength concrete. Discuss the main factors influencing the design of high strength concrete mixes for prestressed concrete work.

(b) Distinguish between Pretensioned and post tensioned members. Discuss the various types of tensioning devices used in Prestressed concrete construction.

(c) Discuss the justification for use of High strength concrete and High tensile strength steel in Prestressed concrete work.

2. Attempt any **Two** parts of the following [**10x2=20]**

(a) Explain the difference between the load carrying mechanism of reinforced and pre-stressed concrete beam sections with sketches.

(b) A pre-stressed concrete beam 200mm wide and 300mm deep, is used over an effective span of 6m to support an imposed load of 4KN/m. The density of concrete is 24KN/m^3.Find the magnitude of

i. The concentric pre-stressing force necessary for zero fibre stress at the soffit when beam is fully loaded.

ii. The eccentric pre-stressing force located 100mm from the bottom of the beam which would nullify the bottom fibre stress due to loading.

(c) What do you understand by losses in pre stressed concrete? Discuss the different types of losses and their calculation in pre-stress concrete structures.

3. Attempt any **Two** parts of the following [**10x2=20]**

(a) A pretensioned prestressed concrete beam having a rectangular section 150mm wide and 350mm deep, has an effective cover of 50mm. If fck =40N/mm^2, fp= 1600N/mm^2 and the area of prestressing steel Ap= 461mm^2, calculate the ultimate flexural strength of the section using IS: 1343 code provisions.

(b) Discuss the Limit state design concept of design of prestressed concrete members.

(c) A pretensioned prestressed beam 250mm wide and 300mm deep is prestressed by 12 wires, each of 7mm diameter initially stressed to 1200 N/mm^2 with their centroids located 100mm from the soffit of beam. Estimate the final percentage loss of prestress due to elastic deformation, creep, shrinkage and relaxation with following data

Relaxation of steel stress= 90N/mm^2,Es= 210KN/mm^2,Ec= 35KN/mm^2
Creep coefficient= 1.6, Residual shrinkage strain= $3x10^{-4}$

4. Attempt any **Two** parts of the following [**10x2=20]**

(a) Discuss how the design of liquid retaining structures differ from usual RCC structures. What are the special provisions recommended to ensure water tightness and durability of water tank container.

(b) Fix the dimensions of the container of Intz tank and Design the top dome, top ring beam and vertical wall of the tank with following data.

Capacity= 1000000 litres, height of staging= 18m up to bottom of tank,SBC of soil= 235KN/m^2 at 2.8m below ground. Use M25 concrete and fe415 steel.

(c) Discuss the Methods of analysis and design of Staging with columns and braces to support the water tank container.

5. Attempt any **Two** parts of the following :- **[10x2=20]**

(a) Discuss the different IRC live loads applied on Bridge Deck to analyse along with width of carriageway and no of lanes to be provided.

i. State Highway Bridge
ii. National Highway Bridge

(b) Discuss the various types of Loadings which act on Bridge piers and Abutments and foundations along with how they are calculated.

(c) The following data pertains to deck slab bridge

Clear distance between abutments= 6.7m
Road: National Highway ,Two lane
Foot path: 1m on either side
Wearing coat= 80mm thick
Loading IRC Class AA Tracked vehicle
Matarials: M20 concrete and fe415 steel.
Analyse the deck slab for maximum bending moment and shear force on the deck under tracked vehicle.