

Total number of printed pages-4

43 (7) STRU-VII 7.5

2016

**STRUCTURES – VII**

Paper : Eng-7.5

Full Marks : 100

Time : Three hours

***The figures in the margin indicate full marks for the questions.***

***Answer any two from question 1-4 and any three from 5-8. Question no-9 is compulsory.***

1. (a) What are the advantages of Pre-stressed concrete? 5
- (b) Describe the losses of Pre-stress. 15
2. (a) Explain the classification of Pre-stressing concrete. 10
- (b) What is the basic concept of Pre-stressed concrete? What are the technical advantages of Pre-stressed concrete in comparison with other forms of construction? 10

*Contd.*

3. (a) Discuss the different forms of concrete shell roofs. How are concrete shell roof analysed? 10
- (b) What are the advantages of a flat slab? Write down the components of a flat slab and draw its reinforcement details. 10
4. (a) What are flat slab? Describe the main components of a flat slab. Discuss the advantages and disadvantages of a flat slab. 10
- (b) Explain why good detailing is necessary for RCC structure. Sketch the detailing for a two-way slab and one-way slab. 10
5. Design the interior panel for a flat slab for a warehouse to suit the following data: 15
- (i) Size of the warehouse is  $24m \times 24m$  divided into panels of  $6m \times 6m$ .
- (ii) Materials M-20 and Fe-415
- (iii) Loading  $5kN/m$ .

6. A Pre-stressed concrete beam  $400 \times 600mm$  in section of  $6m$  and is subjected to uniformly distributed load of  $16kN/m$ , including the self-weight of the beam. The Pre-stressing tenders which are located along the longitudinal centroidal axis providing an effective force of  $960kN$ . Determine the extreme fibre stress in concrete at mid-span section. 15
7. A pre-tensioned beam,  $200mm$  wide and  $300mm$  deep is pre-stressed by 10 wires of  $7mm$  diameter initially stressed to  $1200N/mm^2$ , with their centroids located  $100mm$  from the soffit. Calculate the maximum stress in concrete immediately after transfer, allowing only for elastic shortening of concrete. If the concrete undergoes a further shortening due to creep and shrinkage while there is a relaxation of 5% of steel stress, estimate the final percentage loss of stress in the wires, given the following data-  $E_s = 210kN/mm^2$ ,  $E_c = 5700(f_{cu})^{1/2}$ ,  $f_{cu} = 42N/mm^2$ , Creep coefficient ( $\phi$ ) = 1.6, total residual shrinkage strain =  $3 \times 10^{-4}$ . 15

8. A reinforced concrete column of effective length  $3.0m$  is  $300mm \times 300mm$  carrying an axial load of  $640kN$ . Design the column with M20 concrete and  $F_e - 415$  steel. Draw the details of the column. 15

9. Write short notes on : **(any three)**  $5 \times 3 = 15$

(a) Limitations of Pre-stressed concrete

(b) Shells

(c) Folded Plates

(d) Tendons

(e) Pre-tensioning and Post tensioning

(f) One-way slab and two-way slab

(g) Problems in shell structures.