

D 51094

(Pages : 2)

Name.....

Reg. No.....

**EIGHTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION  
DECEMBER 2008**

CE O4 804 (A)—ADVANCED STRUCTURAL DESIGN—II

(2004 Admissions)

Time : Three Hours

Maximum : 100 Marks

*Assume suitable data if necessary*

1. (a) Differentiate between full prestressing and partial prestressing.  
(b) What are the advantages of shell structures ?  
(c) Explain with sketches "Hoyer's long line system of pretensioning".  
(d) What is pressure or thrust line ? Explain the significance with sketches.  
(e) What are the basic assumptions in membrane theory ?  
(f) Discuss the advantages of folded plate compared to shell structures.  
(g) What are the basic assumptions that are made in the analysis of folded plates ?  
(h) Mention the various methods of analysis available for folded plates.

(8 × 5 = 40 marks)

2. (a) A circular cylindrical shell with edge beams has the following details :

Span of edge beams = 25 m

Radius of the shell = 8 m

Chord width = 10 m

Thickness of shell = 75 mm

Size of edge beam = 250 mm by 1600 mm

Reinforcements in edge beam 12 bars of 25 mm diameter

Grade of concrete M-20

Type of reinforcement = Fe-415 HYSD bars

Effective cover of edge beam reinforcement = 300 mm

Analyse shell for stresses in concrete and steel if the services live load on the shell is

1kN/m<sup>2</sup>. Also design suitable reinforcement in the shell and sketch the details.

(20 marks)

*Or*

- (b) A reinforced concrete shell having semicircular directrix is freely supported at the ends.  
Given :

The data that radius of the shell  $R = 10$  m

Length of shell =  $2L = 40$  m

Thickness of shell =  $t = 60$  mm

Calculate the membrane forces at  $x = 0, 10$  m and  $20$  m and  $\Phi = 0, 30^\circ, 60^\circ$  and  $90^\circ$   
under its own self weight.

**Turn over**

3. (a) A V-shaped folded plate ABCDE spans over 12 m between the traverse and the folds have a uniform thickness of 100 mm. The plates are inclined at  $45^\circ$  to the horizontal and vertical and horizontal projections of each of the plates is 3 m. Edges B and D are the ridges and the edge C from the valley portion. The folded plate is to be analysed for incidental live loads of  $0.75 \text{ kN/m}^2$  of covered area. Analyse the stress distribution for the section at centre of span using the following methods:

- (a) Theorem of three edge shears.  
 (b) Stress distribution procedure (no rotation solution)

Draw the stress diagrams.

(20 marks)

Or

- (b) Design a folded plate roof with V shapes units to cover a store house 9 m wide by 30 m long. Six plates, each having a thickness of 120 mm may be used with plates inclined at  $45^\circ$  to the horizontal. The vertical and horizontal projection of the plates = 1.5 m. Live load =  $0.75 \text{ kN/m}^2$ . Analyse the folded plate using the iteration method and design the longitudinal and transverse reinforcement in the plate. Adopt M-20 grade concrete and tor steel reinforcements. Compare the stresses developed at the centre of span with those resulting from the beam method.

(20 marks)

- (4) (a) A pretensioned beam 250 mm wide and 39 mm deep is prestressed by 12 wires each of 7 mm diameter initially stressed to  $1200 \text{ N/mm}^2$  with their centroids located 100 mm from the soffit. Estimate the final percentage of loss of stress due to elastic deformation, creep, shrinkage, and relaxation using IS 1343-80 code and the following data :

Relaxation of steel stress =  $90 \text{ N/mm}^2$

$E = 210 \text{ kN/mm}^2$   $E = 35 \text{ kN/mm}^2$

Creep coefficient ( $\Phi$ ) = 1.6

Residual Shrinkage strain =  $3 \times 10^{-4}$

(20 marks)

Or

- (b) An unsymmetrical I-section has an overall depth of 2000 mm. The top flange width and depth are equal to 1200 and 300 mm respectively, and the bottom flange width and depth are equal to 750 and 200 mm respectively. The thickness of the web is 300 mm. The tendons having a cross sectional area of  $7000 \text{ mm}^2$  are located 200 mm from the soffit. If the ultimate compressive strength of concrete and the tensile strength of steel are 42 and  $1750 \text{ N/mm}^2$  respectively, and the tendons are effectively bonded to concrete, estimate the flexural strength of the section. (Adopt IS 1343 provisions).

(20 marks)

(3 × 20 = 60 marks)