

Code: 9A01801

**1**

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

**ADVANCED STRUCTURAL ENGINEERING**

(Civil Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions  
All questions carry equal marks

\*\*\*\*\*

- 1 Design an interior panel of a flat slab with panel size 6 m × 6 m supported by columns of size 500 mm × 500 mm. Provide suitable drop. Take live load as 4 kN/m<sup>2</sup>. Use M-20 concrete and Fe-415 steel. Sketch the reinforcement details.
- 2 (a) Distinguish between bunkers and silos.  
(b) Derive the expression for finding horizontal and vertical pressure exerted by stored material of height 'h' in a silo. Use Janssen's theory.
- 3 Briefly explain the procedure adopted in the design of chimneys and draw typical cross-section showing details of reinforcement (vertical and horizontal).
- 4 Design an Intz-type tank to hold 1.5 million litres of water. The height of tank above general ground level is 20 m. The site has a bearing capacity of soil = 250 kN/m<sup>2</sup>. Use M-25 concrete and Fe-415 steel.
- 5 Design a rectangular water tank resting on ground for a capacity of 1,00,000 liters. The materials used are M-20 grade concrete and Fe-415 grade steel. Sketch the reinforcement details.
- 6 Design a counter fort retaining wall to retain levelled soil of 5 m height over the ground level. The density of soil is 16 kN/m<sup>3</sup> and the angle of repose is 30°. The safe bearing capacity of soil is 160 kN/m<sup>2</sup>. The spacing and thickness of counter forts are 3 m and 400 mm respectively. The base slab may be of 4.5 m wide and 400 mm thick. Depth of foundation is 1.2 m. Use M-20 concrete and Fe-415 steel. Sketch the reinforcement details.

Contd. in Page 2

Code: 9A01801

1

- 7 A reinforced concrete grid floor is to be designed to cover a floor area of size 12 m × 6 m. The spacing of the ribs in mutually perpendicular direction is 2 m C/C. Live load = 1.5 kN/m<sup>2</sup>. Use M-20 concrete and Fe-415 steel. Analyze the grid floor for moments and shears by Rankine Grashoff method. Design the floor completely and sketch the reinforcement details.
- 8 Design a cinema balcony with the general layout shown in figure below. Live load including the load due to furniture may be taken as 5 kN/m<sup>2</sup>. The horizontal tread of each step is 900 mm and the rise is 100 mm. The depth of the fulcrum girder is to be limited to 1 m. At the end of the last step there is a gangway 1 m wide and a RC railing 1 m high. Use M-20 concrete and Fe-415 grade steel.

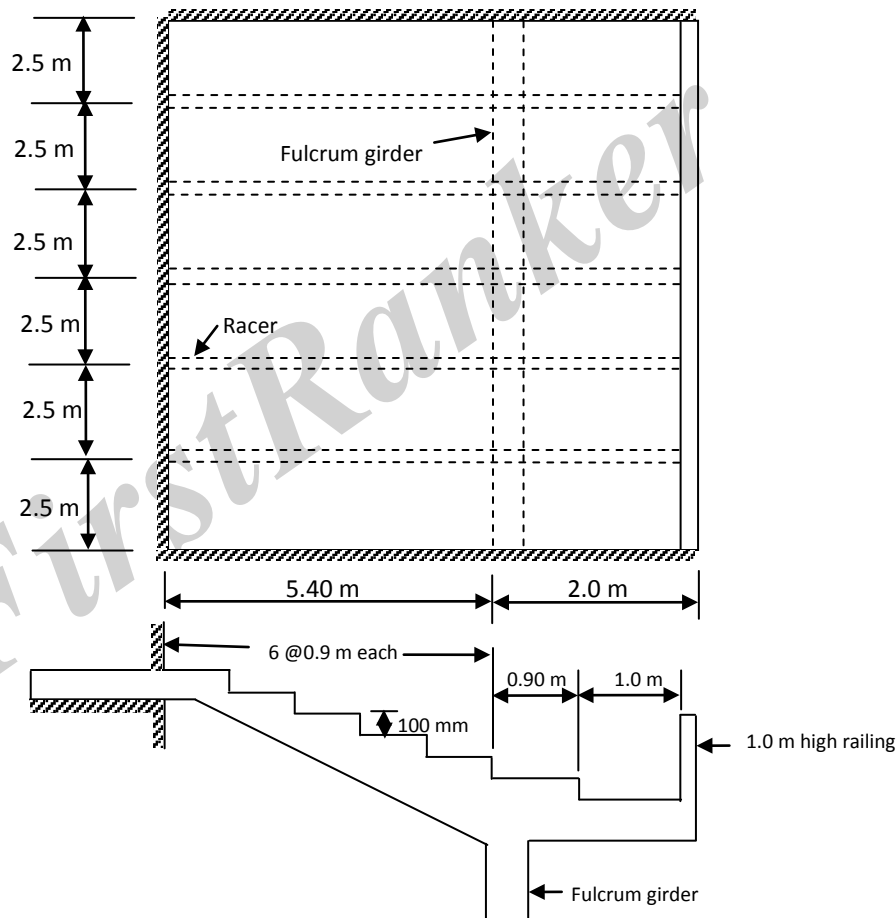


Figure: Cinema balcony

\*\*\*\*\*

Code: 9A01801

2

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

**ADVANCED STRUCTURAL ENGINEERING**

(Civil Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions  
All questions carry equal marks

\*\*\*\*\*

- 1 Design the interior panel of the flat slab of size 6 m × 6 m without providing drop and column head. Size of columns is 500 × 500 mm and live load on the panel is 5 kN/m<sup>2</sup>. Take floor finishing load as 1 kN/m<sup>2</sup>. Use M-20 concrete and Fe-415 steel. Sketch the reinforcement details.
- 2 Design the wall and hopper bottom of a circular cylindrical bunker of capacity 320 kN to store wheat, given: unit weight of wheat = 8.5 kN/m<sup>3</sup>, angle of repose = 28°, coefficient of friction = 0.444. Use M-20 concrete and Fe-415 steel. Sketch the reinforcement details.
- 3 Design a R.C chimney using M-25 concrete and Fe-415 steel for the following requirement and check the stresses at a depth 50 m below the top.  
Diameter of chimney: (i) External = 4.3 m. (ii) Internal = 4.0 m  
Air gap = 100 mm, temperature difference = 80°C.  
Coefficient of thermal expansion =  $11 \times 10^{-6}/^{\circ}\text{C}$ . Assume missing data suitably.
- 4 Design an Intz tank of capacity one million litres supported on symmetrically placed 8 columns. Use M-20 concrete and Fe-415 steel.
- 5 Design a circular tank with flexible base for the capacity of 2,00,000 litres resting on the ground. The depth of water is to be 4 m, including a free board of 0.25 m. Use M-20 concrete and Fe-415 grade steel. Sketch the reinforcement details.
- 6 A counter fort retaining wall has a height of retaining earth of 7 m. The top surface is horizontal behind the wall. The soil behind the wall is a well drained medium dense sand with the following properties. Unit weight = 17 kN/m<sup>3</sup>, angle of internal friction ( $\phi$ ) = 30°. The material under the wall base is the same as above with a safe bearing capacity of 170 kN/m<sup>2</sup>. The coefficient of friction between the base and the soil is 0.55. Design the wall using M-20 grade concrete and Fe-415 steel. Sketch the reinforcement details.
- 7 Design a simply supported R.C grid slab covering an area of 8 m × 12 m. The spacing of ribs in the two orthogonal directions = 2 m C/C. Take the design live load as 2 kN/m<sup>2</sup>. Use M-20 grade concrete and Fe-415 grade steel. Assume the slab thickness as 1/120<sup>th</sup> of span.
- 8 Obtain the fixed end moments for the symmetrically loaded slab less stair case of your choice with odd number of steps.

\*\*\*\*\*

Code: 9A01801

3

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

**ADVANCED STRUCTURAL ENGINEERING**

(Civil Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions  
All questions carry equal marks

\*\*\*\*\*

- 1 Design the interior panel of the flat slab of size 6.6 m × 6.6 m with drop panels over column capitals. Size of the column is 600 mm × 600 mm and the live load on the panel is 3 kN/m<sup>2</sup>. Use M-20 concrete and Fe-415 steel. Sketch the reinforcement details.
- 2 Design the cylindrical walls and hopper bottom of a circular cylindrical bunker of capacity 300 kN to store coal using M-20 concrete and Fe-415 steel. Sketch the reinforcement details. Given:  
Unit weight of coal is 8 kN/m<sup>3</sup>. Angle of repose of coal ( $\theta$ ) = 25°. Coefficient of friction between coal and concrete ( $\mu$ ) = 0.444.
- 3 Derive the expression for calculating stresses at critical depth 'h' from top in a typical chimney for the following cases.
  - (a) The average stress in the middle of shell due to vertical load, wind pressure and
  - (b) The stresses in steel due to temperature difference on the two faces of chimney.
- 4 Design the following components of Intz tank of 2,50,000 litres capacity. The height of staging is 15 m up to the bottom of the tank. The bearing capacity of soil may be assumed to be 250 kN/m<sup>2</sup>. Use M-20 concrete and Fe-415 steel.
  - (a) Top dome.
  - (b) Top ring beam.
  - (c) Cylindrical wall.
- 5 Design a circular water tank with flexible base for a capacity of 1.5 Lakh litres resting on the ground. The maximum height of tank may be 2.5 m. Use M-20 concrete and Fe-415 grade steel. Sketch the reinforcement details.

Contd. in Page 2

Code: 9A01801

3

- 6 Design a cantilever retaining wall to retain an earth embankment 4 m high above ground level. The density of earth is  $18 \text{ kN/m}^3$  and its angle of repose is  $30^\circ$ . The embankment is horizontal at top. The safe bearing capacity of the soil may be taken as  $200 \text{ kN/m}^2$  and the coefficient of friction between soil and concrete is 0.50. Use M-20 concrete and Fe-415 steel. Sketch the reinforcement details.
- 7 Design an interior panel of a grid slab of size  $7.5 \text{ m} \times 7.5 \text{ m}$  for a live load of  $3 \text{ kN/m}^2$ . Floor finish load is  $1.0 \text{ kN/m}^2$ . The materials to be used are M-20 grade concrete and Fe-415 steel. Sketch the reinforcement details.
- 8 The general layout of a slab less tread-rise staircase is shown in figure below. The load may be considered concentrated as shown. Load on landing is replaced by concentrated loads of the same magnitude as in case of steps. Design the staircase. Use M-20 concrete and Fe-415 grade steel.

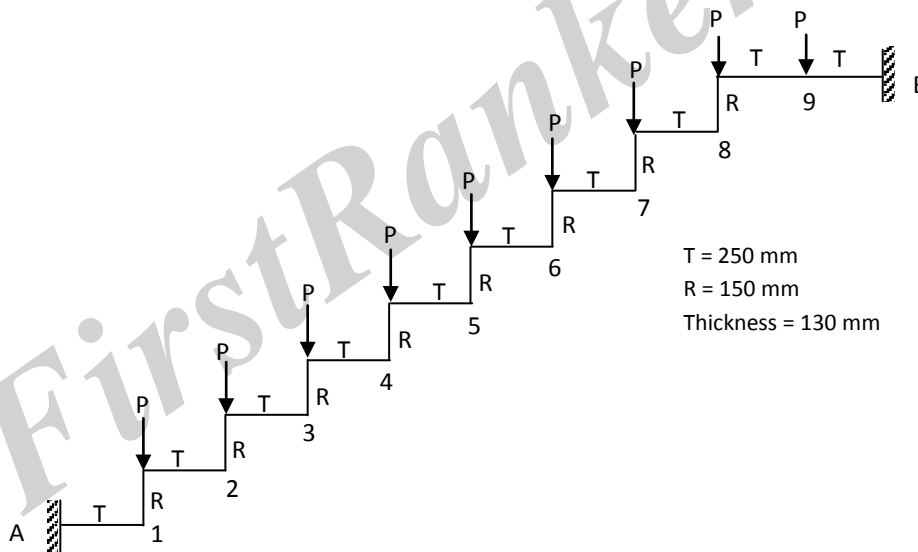


Figure: Stair case

\*\*\*\*\*

Code: 9A01801

4

B.Tech IV Year II Semester (R09) Regular Examinations, March/April 2013

**ADVANCED STRUCTURAL ENGINEERING**

(Civil Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions  
All questions carry equal marks  
\*\*\*\*\*

- 1 Design the interior panel of a flat slab floor of size 5 m × 5 m with suitable drop to support a live load of 4 kN/m<sup>2</sup>. The floor is supported by columns of size 450 mm × 450 mm. Use M-20 concrete and Fe-415 steel. Sketch the reinforcement details by showing cross sections (i) At column strip and (ii) A middle strip.
- 2 A silo with diameter 5.0 m, height of cylindrical portion 20 m and central opening of 0.5 m is to be built to store coal. Design the cylindrical wall of silo, using M-20 concrete and Fe-415 steel. Given:  
Unit weight of coal = 8 kN/m<sup>3</sup>,  
Angle of internal friction = 35<sup>0</sup>.  
Angle of wall friction = 30<sup>0</sup> and  
Pressure ratio = 0.7. Sketch the reinforcement details.
- 3 Design a chimney of height 70 m and check the stresses in bars. Given  
External diameter (i) At top = 4 m (ii) At base = 4.8 m  
Shell thickness (i) At top = 200 mm and (ii) At base = 400 mm.  
Wind intensity = 1.8 kN/m<sup>2</sup> throughout,  
Thickness of brick lining = 100 mm.  
Air gap = 100 mm.  
Temperature difference = 70<sup>0</sup>C.  
Coefficient of thermal expansion = 11 × 10<sup>-6</sup> /<sup>0</sup>C.  
E<sub>s</sub> = 210 × 10<sup>3</sup> N/mm<sup>2</sup>.  
Unit weight of brick lined = 20 kN/m<sup>3</sup>.
- 4 Design the following components of Intz tank of capacity 8,00,000 litres. The height of staging is 10 m, up to the bottom of the tank. Use M-25 concrete and Fe-415 steel.
  - (a) Top dome.
  - (b) Top ring beam.
  - (c) Cylindrical wall.

Contd. in Page 2

Code: 9A01801

4

- 5 Design a rectangular water tank 6 m wide, 8 m long and 3 m deep. The tank is opened at top and walls are rigidly fixed to the base, which rests on firm ground. Use M-20 concrete and Fe-415 steel. Sketch the reinforcement details.
- 6 A cantilever retaining wall having 5 m stem retains levelled soil up to its top. The density of soil is  $20 \text{ kN/m}^3$  and the angle of repose is  $30^\circ$ . The bearing capacity of soil is  $200 \text{ kN/m}^2$ . The coefficient of friction between the soil and the base slab is 0.60. The base slab may be of 3.6 m wide and 500 mm thick. Design the wall by using M-20 concrete and Fe-415 steel. Sketch the reinforcement details.
- 7 A reinforced concrete grid floor of size  $9 \text{ m} \times 13.5 \text{ m}$  is required for a marriage function hall. The floor is subjected to a live load of  $4 \text{ kN/m}^2$ . Assume the rib spacing of 1.5 m in both directions. Design the grid floor adopting M-20 grade concrete and Fe-415 steel. Sketch the reinforcement details.
- 8 Obtain the fixed end moments for the symmetrically loaded slab less stair case of your choice with even number of steps.

\*\*\*\*\*