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Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SIXTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: CE304

Course Name: DESIGN OF CONCRETE STRUCTURES – II (CE)

Max. Marks: 100

Duration: 3 Hours

*Use of IS 456, IS 1343, IS 3370 and design charts of SP 16 is permitted.
Assume any missing data suitably.*

PART A

Answer any two full questions, each carries 15 marks.

Marks

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| 1 | a) Design a short column subjected to a factored load of 1400 kN and a factored bending moment of 135 kNm about one axis. The column has an unsupported length of 3.6 m. Use M25 concrete and Fe415 grade steel. | (12) |
| | b) Write short note on interaction curves for columns. | (3) |
| 2 | a) Define slender columns. Explain the difference in behaviour of a slender column from a short column. | (7) |
| | b) What is a combined footing? What are the different types of combined footings? Explain the situations in which each type of combined footing is used. | (8) |
| 3 | Design an isolated footing for a circular column of diameter 400 mm carrying a service load of 1240 kN. SBC of soil = 200 kN/m ² . Use M20 Concrete and Fe 415 grade steel. | (15) |

PART B

Answer any two full questions, each carries 15 marks.

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|---|--|------|
| 4 | a) Briefly explain different types of retaining walls with neat sketches. Identify the situations in which each type of retaining wall is used. | (8) |
| | b) Explain the design procedure of a spherical dome. | (7) |
| 5 | A cantilever retaining wall is designed to retain earth for a height of 4.5 m. The safe bearing capacity of soil is 180 kN/m ² and unit weight of soil is 17.8 kN/m ³ . Coefficient of friction between soil and concrete is 0.6. Proportion the retaining wall and check for stability. Also design and detail the stem slab of the retaining wall. | (15) |

- 6 Design a circular roof slab, fully restrained at edges, of inside diameter 5.50 m (15) supported on brick walls of thickness 230 mm. The slab supports a live load of 4 kN/m^2 . Use M30 concrete and Fe 415 grade steel. Sketch the reinforcement details.

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Design a circular water tank with fixed base, resting on ground, to store 450 m^3 of water. Use M30 concrete and Fe415 steel. (15)
b) Draw the cross section of water tank showing reinforcement details. (5)
- 8 a) Explain pre-tensioning and post-tensioning concrete with the aid of neat sketches. (12)
b) Why high strength concrete and high tension steel are used in prestressing? (8)
- 9 a) What is loss of stress in prestress? List the losses in prestress. (6)
b) A pre-tensioned prestressed concrete beam of width 180 mm and depth 360 mm is prestressed with 300 mm^2 of steel located at a constant eccentricity 100 mm. The wires are initially tensioned to 1200 N/mm^2 . The span of the beam is 10 m. Calculate the percentage loss of stress in wires, Relaxation of steel is 5% of initial stress, shrinkage of concrete is 300×10^{-6} , creep coefficient = 1.6, $E_s = 210 \text{ kN/mm}^2$ and $E_c = 30 \text{ kN/mm}^2$. (14)

Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

Course Code: CE304
Course Name: DESIGN OF CONCRETE STRUCTURES - II

Max. Marks: 100

Duration: 3 Hours

Use of IS 456, IS 875, IS 1343, IS 3370, SP 16 and SP 34 are permitted.

Assume any missing data suitably

PART A*Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) A short column 300 mm x 600 mm is carrying an axial working load of 700 kN and a moment of 150 kNm at an axis bisecting the depth. Design the reinforcement required if $F_y = 250 \text{ N/mm}^2$ and $f_{ck} = 20 \text{ N/mm}^2$. Also sketch the reinforcement. (10)
- b) Explain the design procedure of a slender column (5)
- 2 a) Design and detail a column under biaxial bending with the following data: (15)
 Size of column = 40 x 60cm
 The column is effectively held in position at both ends but not restrained against rotation. The unsupported length of column is 3.5m
 Concrete grade = M20
 Grade of Steel = Fe 415
 Factored load $P_u = 1900 \text{ kN}$
 Factored Moment $M_{ux} = 150 \text{ kNm}$
 $M_{uy} = 110 \text{ kNm}$
- 3 a) Design and detail an isolated rectangular footing for a column 400 mm x 600 mm to carry a load of 2000 kN. The SBC of the soil is 180 kN/m^2 . Use M20 concrete and Fe 415 grade steel (15)

PART B*Answer any two full questions, each carries 15 marks.*

- 4 a) A cantilever retaining wall is designed to retain earth for a height of 4.4 m. The safe bearing capacity of soil is 200 kN/m^2 and unit weight of soil is 17.5 kN/m^3 . Coefficient of friction between soil and concrete is 0.55. Proportion the retaining wall and check for stability. Also design and detail the heel and toe slab of the retaining wall. (15)
- 5 a) Under what circumstances the counterfort retaining wall is preferred? Give briefly the design procedure of a counterfort retaining wall. Also sketch the reinforcement detail (10)

- b) Explain the design procedure for spherical dome. 5
- 6 a) A circular slab is 5m inside diameter and is fixed at the edges. It is loaded with a live load of 3 kN/m^2 . Design the reinforcement for the slab and sketch the details. Assume M 20 concrete and Fe 415 steel. (15)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Design and detail a circular tank for a capacity of 500000 litres. The depth of water is to be 5m including freeboard of 30cm. The tank is supported on ground. Design using M20 concrete and 415 grade steel. (20)
- 8 a) Discuss in detail the losses involved in prestressing (5)
- b) A post-tensioned cable of a beam 9 m long initially tensioned to a stress of 1000 N/mm^2 at one end. If the tendons are curved so that the slope is 1 in 24 at each end with an area of 600 mm^2 . Calculate the loss of prestress due to the following data 15
- Coefficient of friction between duct and cable – 0.25
Friction coefficient for wave effect - 0.0091/m
During anchorages if there is a slip of 3 mm at the jacking end, calculate the final force in the cable and the percentage of loss due to friction and slip.
 $E_s = 210 \times 10^3 \text{ N/mm}^2$
- 9 a) Explain the principle of prestressing 4
- b) Explain the reasons for using high strength materials in prestressed concrete 6
- c) A rectangular concrete beam 250 mm wide and 550 mm deep is prestressed by means of 4 numbers 12 mm diameter high tensile bars located at 200 mm from the soffit of the beam. If the effective stress in the wire is 700 N/mm^2 , what is the maximum bending moment that can be applied at the soffit of the beam 10

- b) Briefly explain the use and design of ring beam in dome structure. 5
- 6 a) A circular slab is 6 m diameter and is simply supported at the edges. It is loaded with a live load of 4 kN/m^2 . Design the reinforcement for the slab and sketch the details. Assume M 20 concrete and Fe 415 steel. 15

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Design and detail a circular tank with fixed base for a capacity of 6 lakh litres. (20)
The depth of water is to be 5m including freeboard of 250mm. The tank is supported on ground. Design using M20 concrete and 415 grade steel.
- 8 a) Differentiate between pre-tensioning and post-tensioning. (5)
- b) Determine the extreme fibre stresses developed at the mid span section of a simply supported prestressed concrete beam of rectangular section $250 \text{ mm} \times 600 \text{ mm}$ prestressed using high tensile steel of cross sectional area 1000 mm^2 stressed to 1500 N/mm^2 . The center of gravity of the steel is 150 mm above the soffit of the beam. The superimposed load is 16 kN/m . Span of the beam is 12 m. Draw the stress diagram at mid span. 15
- 9 a) Explain the various losses of prestress. 5
- b) A prestressed concrete beam 250 mm wide and 350 mm deep is prestressed by 12 wires of 6 mm diameter located at an eccentricity of 40 mm and carrying a initial stress of 1500 N/mm^2 . The span of the beam is 8 m . Calculate the percentage of losses in wires if it is pretensioned $E_s = 210 \text{ KPa}$ and $E_c = 35 \text{ Kpa}$, relaxation of steel stress = 5% of the initial stress, total shrinkage strain is 200×10^{-6} . 15

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth semester B.Tech examinations (S), September 2020

Course Code: CE304**Course Name: DESIGN OF CONCRETE STRUCTURES - II**

Max. Marks: 100

Duration: 3 Hours

**Use of IS 456 ,IS 1343,IS 3370 & Column interaction curves of SP16 are permitted.
Assume missing data ,if any,suitably.**

PART A*Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) Design an uniaxially eccentrically loaded rectangular column section for the following data : $P_u=2500\text{kN}$, $M_u =125\text{kNm}$ about major axis.Unsupported length = 3.2m , $L_{ex}=3\text{m}$, $L_{ey}=2.75\text{m}$, $f_{ck}=20\text{N/mm}^2$, $f_y=415\text{N/mm}^2$,Use M20 concrete,Fe415 steel. Sketch reinforcement details. (10)
- b) Explain the interaction diagram of columns (5)
- 2 Design a braced column 400x600mm size with factored load of 1700kN & biaxial moments $M_{ux1}=220\text{kNm}$ at top, $M_{ux2}=125\text{kNm}$ at bottom about major axis; $M_{uy1}=120\text{kNm}$ at top, $M_{uy2}=70\text{kNm}$ at bottom about minor axis. Unsupported length of column=9m, $l_{ex}=8.5\text{m}$, $l_{ey}=6.5\text{m}$, Column bends in double curvature. Adopt M25 concrete,Fe415 steel. Show reinforcement details. (15)
- 3 Design a rectangular footing for an axial loaded column carrying 1200kN load ,Size of the column is 300mmx500mm.Safe bearing Capacity of soil is 180 kN/m^2 .Use M25 Concrete and Fe 415 Steel.Sketch reinforcement details of footing in section & plan (15)

PART B*Answer any two full questions, each carries 15 marks.*

- 4 Design & detail stem and heel portion of a cantilever retaining wall for retaining an earth fill of 3.5 m height above the ground. The safe bearing capacity of soil is 150kN/m^2 and unit weight of earth fill is 18kN/m^3 .the angle of friction is 30 deg and coefficient of friction between soil and concrete is 0.50. Use M25 and Fe415 steel. (15)

- 5 Design & detail a spherical dome for a circular water tank of diameter 10m. Rise of dome is 2m. Liveload= 2.5kN/m^2 . $f_{ck}=20\text{N/mm}^2$ and $f_y=415\text{N/mm}^2$ (15)
- 6 Design a circular slab for a room of inside diameter 5m, simply supported on brick wall of 230mm thickness, superimposed u.d.l is 3.5kN/m^2 and weight finishes 1kN/m^2 . Use M20 and Fe415 steel. Sketch reinforcement details in plan & section of slab. (15)

PART C

Answer any two full questions, each carries 20 marks.

- 7 Design a circular tank with flexible base resting on ground for capacity of 4 lakhs litres. The depth of tank is to be 4m including freeboard of 200mm. Use M30 Concrete & Fe415 Steel. Draw the reinforcement details in sectional elevation & plan through tank wall. (20)
- 8 An unsymmetrical I section is used to support an imposed load 10kN/m over a span of 8m. Section details are Top flange= $300\times 60\text{mm}$: Bottom Flange= $100\text{mm}\times 60\text{mm}$: Overall depth of the beam = 400mm : thickness of web= 80mm . Initial prestressing force of 300kN is applied at 100mm above soffit of the beam. Estimate the stresses at the centre of span section of the beam for the following condition. 1) Prestress+self weight 2) Prestress, self weight, liveload. Assume total loss as 20%. Show stress diagrams. (20)
- 9 A Prestressed concrete pile $300\text{mm}\times 300\text{mm}$ and is provided with 40 wires of 3mm diameter distributed uniformly over the section, Initially the wires are tensioned in the bed with total pull of 200kN . Determine the final stress in the section and the percentage loss of stress in wires. Relaxation loss of stress in steel= 4.5% of initial stress. $E_c=35\text{kN/mm}^2$, $E_s = 210\text{kN/mm}^2$, Creep coefficient 1.6; Shrinkage strain= 3×10^{-4} (20)
