

Reg No.: _____

Name: _____

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)

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- 5 Design & detail a spherical dome for a circular water tank of diameter 10m. Rise of dome is 2m. Liveload=2.5kN/m². $f_{ck}=20\text{N/mm}^2$ 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/m² and weight finishes 1kN/m². 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=300x60mm: Bottom Flange=100mmx60mm: 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+selfweight 2) Prestress, self weight, liveload. Assume total loss as 20%. Show stress diagrams. (20)
- 9 A Prestressed concrete pile 300mmx300mm 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 200 kN. 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)
