Mansoura University	Department: Structural Engineering Examiner: Prof. Dr. Ahmed Yousef Total Marks: 50 Marks	Faculty of Engineering

Course Title: Reinforced Concrete (1)	Course Code: NSTE9	Year: BCE200
Date: January 2018 (Self Study)	Allowed Time: 3.0 hrs	No. of Pages: (2)

Notes: 1. Any missing data is to be reasonably assumed.
2. Design Aids can be used.

Question 1: (4 Points)

a. Explain why compression reinforcement is used in beams?

b. Compare between tension failure and compression failure in reinforced concrete columns subjected to eccentric force.

Question 2: (10 Points)

It is required to draw the absolute moment of resistance diagram and to check the termination of bent-up steel bars of a simply supported beam of span 8.30 m with one cantilever of span 3.45 m. The total ultimate load, P_u , of the beam and the slabs is assumed to be in the form of two equal concentrated loads one at the middle of the simply supported span and the other at the edge of the cantilever (P_u = 280 kN, the dead load g = 150 kN and the live load p = 130 kN). The cross-section of the beam is T-section of dimensions 300 mm * 750 mm and the slab thickness is equal to 120 mm. Use f_{cu} = 30 N/mm^2 and steel 400/600.

Question 3: (8 Points)

A simply supported rectangular beam of 550 mm wide having an effective depth of 950 mm carries a total ultimate load of 355 kN/m' on a clear span equal to 8.50 m. It is reinforced with 12Φ25 as a tensile steel. The design characteristic strength of concrete is equal to 30 N/mm^2. Design the beam for shear using bent-up bars and draw to scale 1:50 the diagonal tension diagram.

Question 4: (8 Points)

Using the ultimate limit states method, calculate the ultimate load P_u and the corresponding eccentricity e for a tension failure of a section subjected to combined bending moment and axial load. The breadth of the section is equal to 300 mm and the total height is equal to 900 mm. The cross-section is symmetrically reinforced with $A_s = A_s' = 4\Phi25$. Use steel 360/520 and concrete with f_{cu} = 25 MPa.

Question 5: (8 Points)

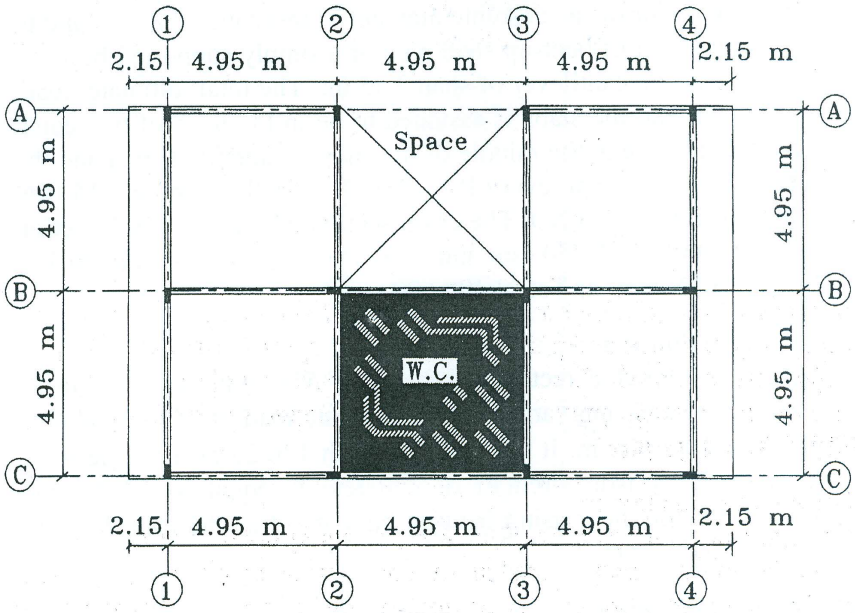
Using the Working Stress Method, design a cross-section subjected to eccentric tension. Given Data: t = 950 mm, b = 250 mm, T_u = + 510 kN and M_u = 370 kN.m, f_{cu} = 30 N/mm^2 and f_y = 400 N/mm^2. Draw to scale 1:10 the details of reinforcement.

Question 6: (12 Points)

The figure shows the structural plan of the first story of R/C building. Assume that the slab live load is 7.50 kN/m^2 and the covering materials is 2.0 kN/m^2. Using steel 360/520 and concrete with f_{cu} = 30 MPa, it is required to:

a) Design the solid slabs of the part of the roof between axis 1-1 and axis 3-3 including the cantilever parts. (8 Points)

b) Draw to scale 1:50 the details of reinforcement. (4 Points)



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