

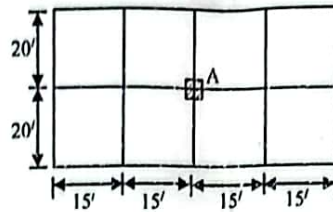
Full marks: 72

Time: 3 Hours

- N.B:-** (i) Answer any **SIX** questions, taking **THREE** from each section.
 (ii) Figures in the margin indicate full marks.
 (iii) Use separate answer script for each section.
 (iv) Assume reasonable value for any data missing.

SECTION-A

- Q.1 (a) Why are corner reinforcements provided in two-way slab? 2.00
 (b) An isolated corner slab about 12x15 ft. Design the slab for live load of 125 psf. Use $f'_c = 3000$ psi and $f_y = 50000$ psi. 10.00
- Q.2 (a) Write short notes on: (i) Short column (ii) Slender column (iii) Tied column and spiral column 3.00
 (b) Define slenderness ratio. 'Spiral column can support more loads than tied column' Explain the statement. 3.00
 (c) Design a tied column for a five-storied building as shown in figure below using the following information: 6.00
 (i) slab thickness = 5"; (ii) LL on the floor = 100 psf; (iii) Size of the beam = 12"x18" on both direction;
 (iv) $f'_c = 4000$ psi and $f_y = 60000$ psi. Follow USD method.

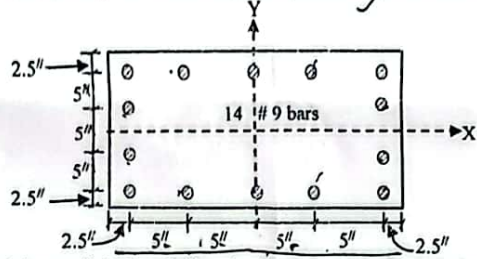


$$\rho/p_a = \frac{M_x}{M_y} +$$

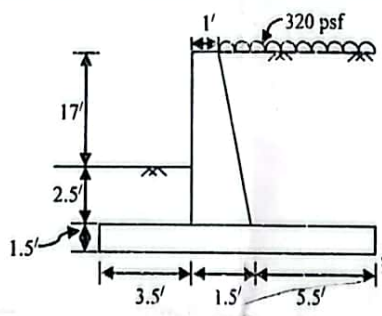
$$\rho_a = 0.34 \rho_{gm}$$

$$\rho_a = 0.34 f'_c A_g (1 + \rho_{gm})$$

- Q.3 (a) Explain the functions of lateral reinforcement used in R.C. column. 2.00
 (b) A column section is shown in figure below. Verify the capacity of the section if $P = 230$ k, $M_x = 1020$ k-inch, $M_y = 1400$ k-inch, $f'_c = 3$ ksi, and $f_y = 60$ ksi. Use (i) Reciprocal load method (ii) Bresler equation. 10.00



- Q.4 Design a cantilever retaining wall (upto stability check) as shown in figure below with $\phi = 30^\circ$, $f = 0.05$, $\gamma = 120$ pcf, allowable soil pressure = 8000 psf, $f'_c = 3$ ksi and $f_y = 50$ ksi. 12.00



SECTION-B

- Q.5 (a) Define flat slab. List the advantages of flat slab. 3.00
 (b) Design an interior panel of flat slab 24 ft by 24 ft for a total load of 280 psf including self-weight of slab. Use $f'_c = 3$ ksi and $f_y = 60$ ksi. 9.00
- Q.6 (a) Describe the guidelines for establishing axes of rotation and yield lines. 4.00
 (b) Show that a concentrated load 'P' acts on a circular reinforced concrete slab at the center is independent of the radius 'r' of that circular slab. Assume the collapse load is 'P'. 4.00
 (c) Briefly explain the concept of collapse mechanism with example. 4.00
- Q.7 (a) Draw pressure diagram for eccentrically loaded footing. 2.00
 (b) A 15-inch concrete wall supports a dead load of 12 kips/ft and a live load of 10 kips/ft. The allowable bearing pressure of soil is 4.5 kips/ft² at the level of the bottom of the footing, which is 3.5 ft below grade. Design a footing for this wall using $f'_c = 4000$ psi and $f_y = 60000$ psi. 10.00
- Q.8 (a) Define foundation. What are the measures to be taken to limit settlement? 3.00
 (b) Design a square slab footing to support concentric column dead load of 400 kips and live load of 300 kips. The column size is 20 inch square. Allowable soil bearing pressure is 5000 psf. Given $f'_c = 3500$ psi and $f_y = 50000$ psi. 9.00

CE 3217
Reinforced Concrete - II

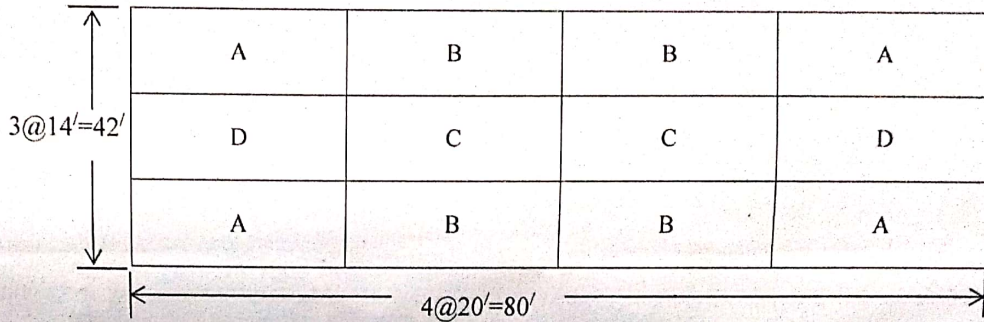
Full marks: 72

Time: 3 Hours

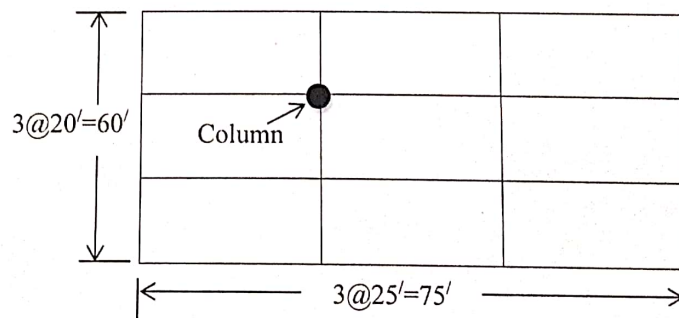
- N.B:-**
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 - (iv) Assume reasonable value for any data missing.

SECTION-A

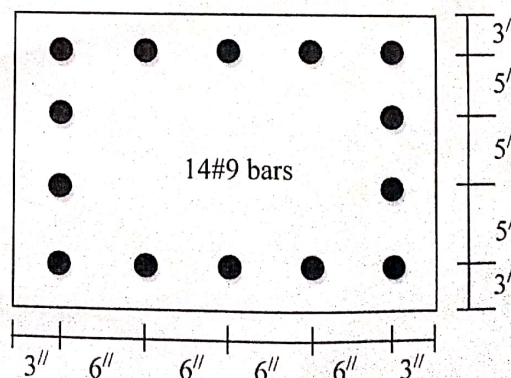
- Q.1(a) What is two-way slab? Mention the difference between one-way and two-way slabs. 3.00
- (b) Design slab panel B for the floor system shown in figure below. Assume floor finish = 30 psf, live load = 60 psf, $f_c = 3$ ksi, $f_y = 60$ ksi and beam width = 12 in. 9.00



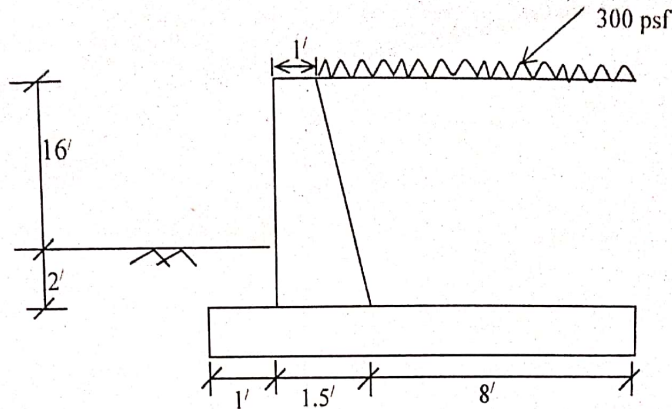
- Q.2(a) Distinguish among tied, spiral and composite columns. 3.00
- (b) Explain why transverse reinforcement are used in RC columns. 2.00
- (c) Design a round spiral column for a six story building as shown in figure below. Assume (i) uniform live load on the floor = 125 psf, (ii) uniform dead load on the floor = 100 psf, the dead load includes weight of all members and floor finishing etc., (iii) $f_c = 4$ ksi and $f_y = 60$ ksi. Draw the working diagram following code guidelines. Follow USD method. 7.00



- Q.3(a) Write short notes on (i) plastic centroid (ii) interaction diagram (iii) slender column. 3.00
- (b) For the tied column section shown in figure below (i) draw the interaction diagram about x-axis 9.00
 (ii) verify if the section allowed to take $P = 450$ k, at an eccentricity $e = 5''$. Assume $f_c' = 4$ ksi and $f_y = 60$ ksi.

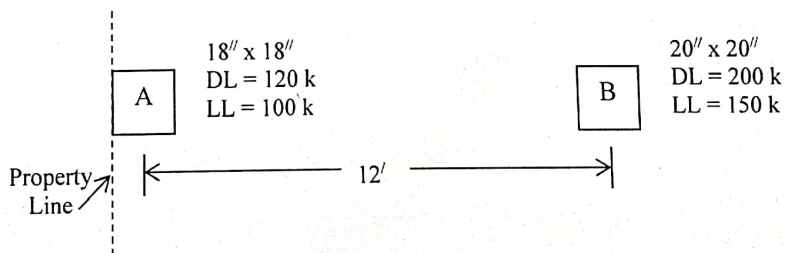


- Q.4 Design the stem of the retaining wall shown in figure below with $\phi = 30^\circ$, $f = 0.5$, $\gamma = 120$ pcf, 12.00
 allowable soil pressure = 3.5 ksf, $f'_c = 3$ ksi and $f_y = 50$ ksi.



SECTION-B

- Q.5 (a) Define drop panel. Write the functions of column capital. 2.00
 (b) Design an interior panel of flat slab 20 ft by 20 ft for a total load 300 psf including self-weight of slab. Use $f'_c = 3500$ psi and $f_s = 24000$ psi. 10.00
- Q.6(a) Describe the upper bound theory. 2.00
 (b) Describe the guidelines for establishing axis of rotation and yield lines. 3.00
 (c) A two-way slab 10 ft by 20 ft is simply supported on all four sides and isotropically reinforced. Determine the required moment resistance of slab to carry a uniformly distributed load w . 7.00
- Q.7(a) Write the functions of foundation. 2.00
 (b) A $18'' \times 18''$ column having a load of 300 kips is to be supported by a foundation bed having bearing capacity of 3 ksf. Design a rectangular footing to support this column. Assume $f'_c = 4000$ psi and $f_y = 60000$ psi. 10.00
- Q.8(a) Explain why the punching shear is considered in the design of column footings but not to wall footings. 2.00
 (b) Design a rectangular combined footing for the two columns shown in figure below. Use, $q_a = 5$ ksf, $f'_c = 3000$ psi and $f_y = 60000$ psi. The bottom of the footing is to be 6 ft below the grade. 10.00



CE 3217

Reinforced Concrete - II

Full Marks: 72

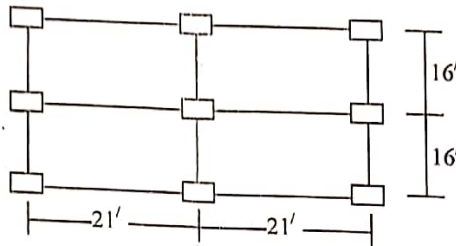
Time: 3 Hours

N.B.:-

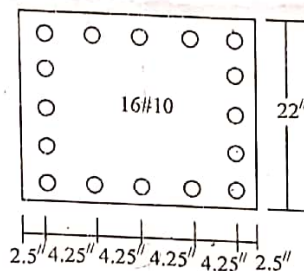
- (i) Answer any **SIX** questions, taking **THREE** from each section.
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SECTION-A

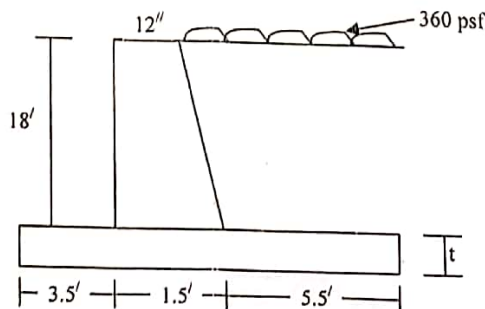
- Q.1 (a) Specify the moment coefficient for a simply supported square slab and explain how it is derived. 3.00
- (b) Figure shows floor plan of a RC beam-column slab, with 12"x18" beam and 5" thick partition walls along column lines. Floor loads also include FF = 25 psf. Design the slab with neat sketch of reinforcements using $f'_c = 4000 \text{ psi}$ and $f_y = 60,000 \text{ psi}$. Follow USD method. 9.00



- Q.2 (a) Define column. Classify column with brief description of each type. 3.00
- (b) For the column section shown in figure below determine the balanced load, moment and eccentricity if $f'_c = 4 \text{ ksi}$ and $f_y = 60 \text{ ksi}$. 9.00



- Q.3 (a) Explain the necessity of lateral reinforcements in columns. 2.00
- (b) Design a square tied column for an applied compressive force of 500 kips, and draw the section. Follow WSD method and use $\rho_g = 2\%$, $f'_c = 3 \text{ ksi}$ and $f_s = 20 \text{ ksi}$. 6.00
- (c) Design the spiral for a 20 in. diameter column reinforced with G60 steel (8#10 bars). Assume 1.5 in. concrete cover and $f'_c = 4 \text{ ksi}$. 4.00
- Q.4 (a) Describe different types of forces acting on retaining wall. Briefly explain the advantages of key. 3.00
- (b) Design the base of the retaining wall shown in figure below. Assume (i) $\gamma_{\text{soil}} = 120 \text{ pcf}$, (ii) $\phi = 30^\circ$, (iii) Surcharge = 360 psf, (iv) $f'_c = 3 \text{ ksi}$, and (v) $f_s = 20 \text{ ksi}$. 9.00

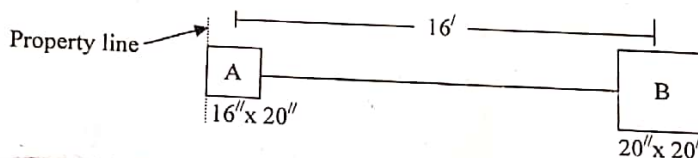


SECTION-B

- Q.5 (a) Write the function of drop panel. 2.00
 (b) Design a 21 ft square interior panel of a flat slab floor with drop to carry a live load of 230 psf in addition to its own weight using $f'_c = 3000 \text{ psi}$ and $f_s = 20,000 \text{ psi}$. 10.00
- Q.6 (a) Define foundation. Distinguish between shallow and deep foundation. 3.00
 (b) A 21-inch diameter reinforced concrete column carries an axial dead load of 210 kips and an axial live load of 180 kips. Design a footing for this column load using $f'_c = 4000 \text{ psi}$, $f_y = 60,000 \text{ psi}$ and safe bearing pressure of soil is 4.5 ksf. 9.00
- Q.7 (a) Define Yield line. Write the limitation of Yield line theory. 3.00
 (b) Describe the guidelines for establishing axes of rotation and Yield lines. 4.00
 (c) A square slab is simply supported along all sides and is to be isotropically reinforced. Determine the resisting moment $m = \phi m_n$ per linear foot required just to sustain a uniformly distributed factored load of $w \text{ psf}$. 5.00
- Q.8 A combined rectangular footing supports two column loadings as shown in the figure. The loading are: 12.00

Column	Dead load (kip)	Live load (kip)
A	175	100
B	275	150

Proportion the dimension of the footing. Assume depth of footing = 5', $q_a = 4000 \text{ psf}$, $f'_c = 3000 \text{ psi}$ and $f_y = 60,000 \text{ psi}$. Find reinforcement in the longitudinal direction.



Heaven's Light is Our Guide
DEPARTMENT OF CIVIL ENGINEERING
RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
 B.Sc. Engineering **THIRD** year **EVEN SEMESTER** Examination, 2017

CE 3217
Reinforced Concrete - II

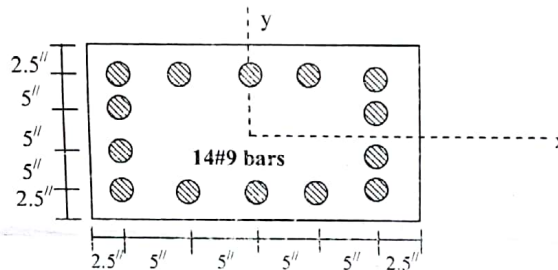
Full Marks: 72

Time: 3 Hours

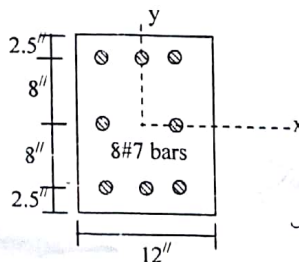
- N.B.:-**
- (i) Answer SIX questions, taking THREE from each section.
 - (ii) Figure in the margin indicates full marks.
 - (iii) Use separate answer script for each section.
 - (iv) Assume reasonable value for any data not given.

SECTION-A

- Q.1(a) What is two-way slab? Mention the differences between one-way and two-way slabs. 3.0
- Q.1(b) Design a two-way slab panel of size 14ft by 18ft. Assume (i) All sides are supported on simple supports (ii) Dead load 70 psf (iii) live load 80 psf (iv) $f'_c = 4$ ksi and (v) $f_y = 60$ ksi. Follow USD method and draw reinforcement details. 9.0
- Q.2(a) Explain why transverse reinforcements are used in RC columns. Compare between the effect of ties and spirals on the strength and ductility of columns. 3.0
- Q.2(b) For the column section shown in figure below draw the interaction diagram about x axis. Follow WSD method. Use $f'_c = 3$ ksi and $f_y = 60$ ksi. 3.0



- Q.3(a) Explain why the factors ϕ and α are used for column design. 3.0
- Q.3(b) A corner column section is shown in figure below. The column is designed to carry a factored compressive load $P_u = 200$ k, a factored bending moment $M_{ux} = 100$ k-ft about the x-axis and a factored bending moment $M_{uy} = 75$ k-ft about y axis. Check whether the section is adequate if $f'_c = 4$ ksi and $f_y = 60$ ksi. 9.0



$$\frac{P}{P_b} + \frac{M_{ux}}{M_{uxb}} + \frac{M_{uy}}{M_{uyb}}$$

$$\frac{1}{P_{my}} = \frac{1}{P_m} + \frac{1}{P_y} - \frac{1}{P_o}$$

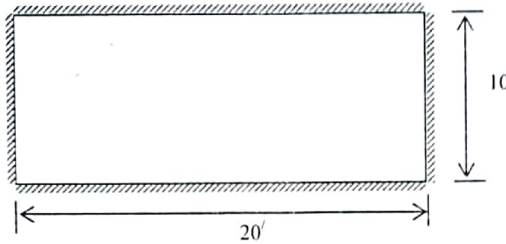
- Q.4 Make a preliminary design of a cantilever retaining wall to retain a backfill 15 ft high. Also design the stem. Assume unit weight of backfill = 110 pcf, $\phi = 30^\circ$, allowable soil bearing capacity = 4 ksf, $f = 0.5$, surcharge = 275 psf, $f'_c = 3$ ksi and $f_s = 24$ ksi. 12.0

SECTION-B

*f_{ti} chorem
punching
beam
moment
depth
re in fence*

- Q.5(a) Define drop panel. Write the functions of drop panel. 2.0
 (b) Design an interior panel of flat slab with drop panels having column spacing of 24 ft on centers in both directions. The live load on the flat slab is 130 psf. Use $f'_c = 3$ ksi and $f_y = 60$ ksi. 10.0

- Q.6(a) State the upper bound theorem. Write down the limitations of yield line theory. 4.0
 (b) The two-way slab shown in figure below is simply supported on all four sides and carries a uniformly distributed load of 80 psf. Determine the required moment resistance for the slab, which is to be isotropically reinforced. 8.0



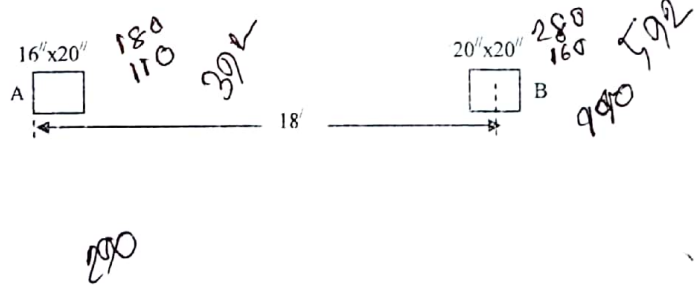
$A_s = \frac{M}{\phi f_y (d - \frac{a}{2})}$

- Q.7(a) Explain why punching shear is considered in the design of column footings but not for wall footings. 3.0
 (b) Distinguish between allowable soil pressure and net soil pressure in the design of footings by USD. 2.0
 (c) Design a wall footing for an 18 in. brick wall carrying a service load of 14 k/ft live load and 16 k/ft dead load using $f'_c = 3,000$ psi, $f_y = 60,000$ psi and allowable soil pressure $q_a = 5000$ psf. 7.0

- Q.8 A combined rectangular footing supports two column loadings as shown in the figure. The loadings are 12.0

Column	Dead load (kips)	Live load (kips)
A	180	110
B	280	160

Assume depth footing 5 ft below the grade, $q_a = 4500$ psf, $f'_c = 3,000$ psi and $f_y = 60,000$. Find reinforcement in the longitudinal direction.



OK

CE 3217
Reinforced Concrete - II

Full Marks: 72

Time: 3 Hours

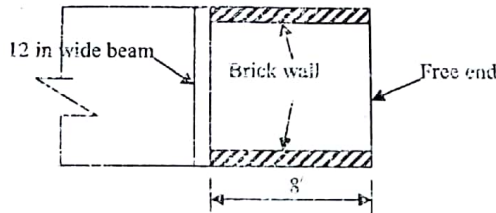
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SECTION-A

2/1ab

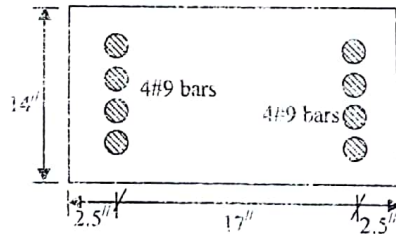
- Q.1(a) Describe different types of slab. Prove that a slab can be designed as a two-way slab if the long to short span ratio of the slab is smaller than two. 4.0
- (b) An 8' x 15' slab is to be designed as a two-way slab to support a live load of 80 psf. The slab is supported on brick walls on two opposite sides and on a beam as shown in figure below. Design the slab assuming $f'_c = 5000$ psi and $f_y = 50,000$ psi. Follow USD method and draw reinforcement details. 8.0



col

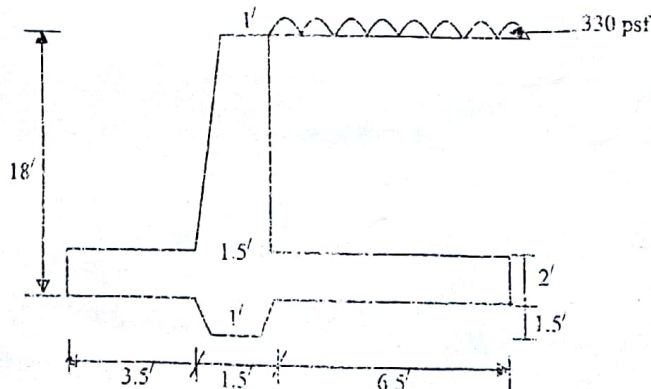
- Q.2(a) Define column. Describe different types of column. 3.0
- (b) Explain the behavior of tied and spiral columns under axial load. 3.0
- (c) A column section 16 in. diameter is reinforced with 8#10 bars. Determine the allowable ultimate load using $f'_c = 4$ ksi and $f_y = 60$ ksi. Also design the lateral reinforcement and draw the section. 6.0
- Q.3(a) Describe the functions of lateral reinforcements in a column. 2.0
- (b) Determine the nominal compressive strength of the section shown in figure below for an eccentricity of 10 in. Assume $f'_c = 4$ ksi and $f_y = 60$ ksi. 10.0

col



RW

- Q.4(a) Define retaining wall. Describe different types of retaining wall. 2.0
- (b) Check the adequacy of the retaining wall shown in figure below with regard to overturning, sliding and allowable soil pressure. Assume weight of backfill = 110 pcf, $\phi = 30^\circ$, allowable soil bearing capacity 3 ksi, coefficient of friction between concrete and soil $\mu = 0.5$. 10.0



SECTION-B

FS
FP

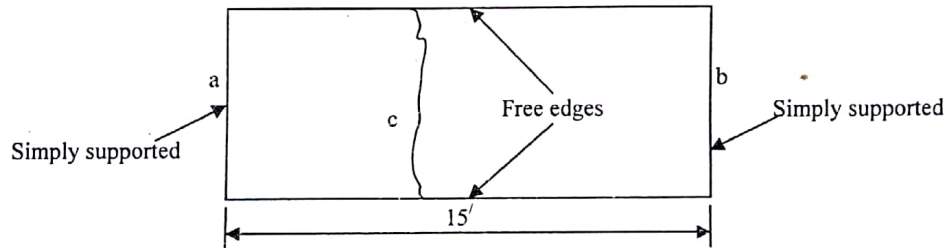
- Q.5(a) Drop panel is an essential element of a flat slab floor system. Do you agree the statement? Justify your answer. 2.0
- (b) Design an 14 ft x 16 ft flat plate interior panel for a service dead load including its own weight of 100 psf and a live load of 60 psf. Assume 15 in. square columns, $f'_c = 4,000$ psi and $f_y = 60,000$ psi. 10.0

SF

- Q.6(a) Explain with neat sketch for the statement 'Clay soils pressure are higher near the edge than at the center of the footing'. 3.0
- (b) An interior column for a tall concrete structure carries total service loads $D = 500$ kips and $L = 514$ kips. The column is 22 x 22 in. in cross section and is reinforced with twelve No. 11 bars centered 3 in. from the column faces (equal number of bars in each face). The column will be supported on a square footing with the bottom of the footing 6 ft below grade. Design the footing considering the allowable soil bearing pressure is 8000 psf and materials strengths for the footing are $f'_c = 3,000$ psi and $f_y = 60,000$ psi. 9.0

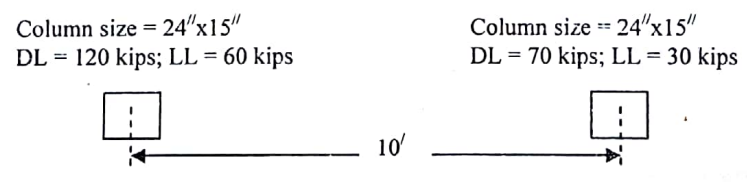
Y

- Q.7(a) Describe the guidelines for establishing axes of rotation and yield lines. 3.0
- (b) Show that a concentrated load 'P' acts on a circular reinforced concrete slab at the center is independent of the radius 'r' of that circular slab. Assume the collapse load is 'P'. 4.0
- (c) The yield moment at a is $m_a = -5$ ft-kips/ft, at b is $m_b = -4$ ft-kips/ft and for positive moment is $m_c = 6$ ft-kips/ft shown in figure below. By the yield line method, calculate the ultimate uniform load the slab will support on a 15 ft span. 5.0



GF

- Q.8(a) Distinguish between shallow and deep foundations. State the general requirements for footing design. 2.0
- (b) Design a combined rectangular footing to support two columns shown in the figure below. The bottom of the footing is 6 ft below the grade. Assume $f'_c = 4,000$ psi and $f_y = 60,000$ psi and allowable soil pressure = 2000 psf. 10.0



CE 317
Reinforced Concrete - II

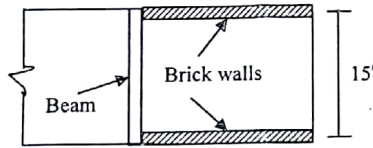
Full Marks: 70

Time: 3 Hours

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- (i) Answer SIX questions, taking THREE from each section.
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SECTION-A

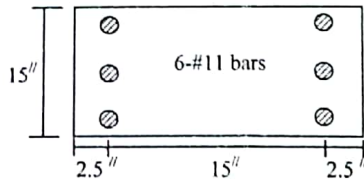
- 2 slab } Q.1(a) Prove that a slab can be designed as a one-way slab if the long to short span ratio of the slab is larger than 2. 3.00
 (b) A 10 ft by 15 ft slab is supported in brick walls in two opposite sides and on a beam on the third side as shown in figure below. The slab is to be designed for a live load of 100 psf. Assume $f'_c = 3000$ psi and $f_y = 20,000$ psi. 8.67



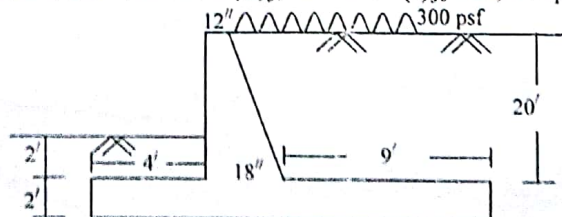
- Y } Q.2(a) Explain yield line theory. State the assumptions made in this theory. What are the limitations of yield line theory? 3.67
 (b) Find ultimate load capacity of a 14 ft x 21 ft slab continuous on all edges. Assume (i) yield moment capacity for positive yield lines = 3 kips-ft/ft (ii) yield moment capacity for negative yield lines = 5 kips-ft/ft. 8.00
- col } Q.3(a) Define column. Draw the load-deformation curves for tied and spiral columns and explain. 4.00
 (b) A circular column having a diameter of 25 in is reinforced with 8-#10 bars. Calculate the ultimate load carrying capacity of the column. Also design the spiral assuming a clear cover of 2 in. Consider $f'_c = 4000$ psi and $f_y = 60,000$ psi. 7.67
- WF } Q.4(a) Define foundation. State the general requirements for footing design. 2.00
 (b) Briefly discuss different types of single column footing. Draw pressure distribution diagram under footing for different types of soil. 3.00
 (c) Design a reinforced concrete footing for a masonry wall 15 inch thick carrying a total load of 20 k/ft. The safe bearing capacity of soil is 3000 psf. Assume $f'_c = 4000$ psi and $f_y = 24,000$ psi. 6.67

SECTION-B

- FS } Q.5(a) Define column capital. Write the function of drop panel. 2.00
 (b) A flat slab floor system is to support a dead load of 125 psf including its self weight and a service live load of 225 psf having column spacing of 23 ft on centers in both directions. Using 8-ft drop panel, design the slab. Assume $f'_c = 3000$ psi and $f_y = 50,000$ psi. 9.67
- column } Q.6(a) What is interaction diagram? Describe different parts of an interaction diagram with equation for WSD method. 3.00
 (b) A 15" x 20" column is reinforced with 6-#11 bars as shown in figure below. Find the ultimate load and corresponding moment for an eccentricity of $e = 8$ inch. Assume $f'_c = 4$ ksi and $f_y = 60$ ksi. 8.67



- SF } Q.7(a) Describe the functions of foundation. Distinguish between shallow and deep foundations. 3.00
 (b) A column 20 inch square, with $f'_c = 4$ ksi reinforced with 10-#8 bars of $f_y = 50$ ksi, supports a dead load of 200 kips and a live load of 190 kips. The allowable soil pressure is 4 ksf. Design a square footing by using ultimate strength design method. 8.67
- RW } Q.8 A section of a cantilever retaining wall is shown in figure below. Check the external stability and design the stem of the wall. Assume (i) $\phi = 32^\circ$ (ii) unit weight of soil = 110 pcf (iii) coefficient of friction between concrete and soil = 0.5 (iv) $f'_c = 3$ ksi and (v) $f_y = 24,000$ psi. 20 ksf 11.67



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CE 317

Reinforced Concrete - II

Full Marks: 70

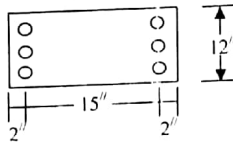
Time: 3 Hours

- N.B.:-**
- (i) Answer SIX questions, taking THREE from each section.
 - (ii) Figure in the margin indicates full marks.
 - (iii) Use separate answer script for each section.
 - (iv) Assume reasonable value for any data missing.

SECTION-A

Q.1 Design a 21 ft square interior panel of a flat slab floor with drop to carry a live load of 225 psf in addition to its own weight using $f'_c = 3000$ psi and $f_s = 20,000$ psi. 11.67

Q.2(a) Write the specifications for lateral reinforcement of a column. 2.00
(b) The column section shown below in the figure is reinforced with six No. 8 bars. Estimate by USD method, the ultimate load of the column for an eccentricity of 12 inch. Data given: $f'_c = 4000$ psi and $f_y = 60,000$ psi. 9.67

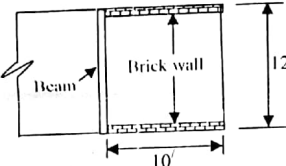


Q.3(a) Define flat slab and flat plate. 2.00
(b) An 18 ft by 20 ft interior panel of a flat plate is to be designed to carry a live load of 130 psf in addition to its own weight. Find slab thickness and show reinforcement for the column strip in the longer direction. Assume $f'_c = 3000$ psi and $f_y = 40,000$ psi. 9.67

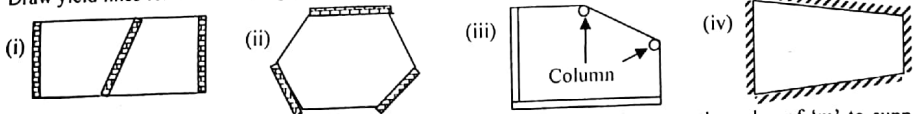
Q.4(a) Define foundation. What measures are to be taken to limit settlement? 2.67
(b) Design a square slab footing to support concentric column load of 400 kips dead and 300 kips live. The column size is 20 in-square. Allowable soil bearing pressure is 5000 psf. Given: $f'_c = 3500$ psi and $f_y = 50,000$ psi. 9.00

SECTION-B

Q.5(a) Distinguish between one-way slab and two-way slab. 2.00
(b) A 10 ft by 12 ft slab is supported on brick walls on two opposite sides and on a beam on the third side as shown in figure below. The slab is to be designed for a live load of 100 psf. Assume $f'_c = 3000$ psi and $f_s = 24,000$ psi. 9.67



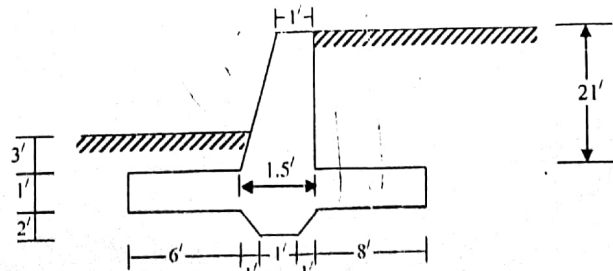
Q.6(a) Briefly explain the concept of yield line analysis. 2.00
(b) Draw yield lines for the following structures: 2.00



(c) A square slab is fixed on all four sides and is isotropically reinforced. Compute the value of 'm' to support a uniform load w. 7.67

Q.7(a) What is an interaction diagram? Draw a typical interaction diagram and explain its various significant points. 3.00
(b) Design completely by WSD method a circular column to carry an axial load of 75 kips. Assume $f'_c = 4000$ psi and $f_s = 24,000$ psi. 8.67

Q.8 A retaining wall section is shown in figure below. Check the safety against sliding and overturning. Also design the stem of the wall. Assume (i) Angle of internal friction = 30° , (ii) unit weight of soil = 120 pcf, (iii) coefficient of friction = 0.5, (iv) $f'_c = 3000$ psi, and (v) $f_s = 24,000$ psi. 11.67



The End

CE 317
Reinforced Concrete-II

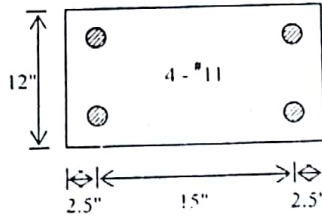
Full marks: 70

Time: 3 Hours

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SECTION-A

- PS {
- Q.1(a) Define column capital and drop panel. What are their functions? 3.00
- (b) A flat slab floor system is to support a dead load of 100 psf including its self weight and a service live load of 200 psf having column spacings of 21 ft on centres in both directions. Using 7-ft drop panel, design the slab and find reinforcement for column strip. Assume $f'_c = 3,000$ psi, $f_y = 20,000$ psi. 8.67
- T Colo {
- Q.2 (a) State the functions of lateral reinforcement in column. 2.00
- (b) Design by WSD method a tied column for a total working load of 250 kips with an eccentricity of $e = 8$ inch using concrete with $f'_c = 3,000$ psi and steel with $f_y = 40,000$ psi. 9.67
- column {
- Q.3 A 12"x20" column is reinforced with 4 - #11 bars at the corners as shown in the figure. Find ultimate load and the corresponding moment for an eccentricity of $e = 7$ inch using $f'_c = 4,000$ psi and $f_y = 60,000$ psi. 11.67



- F {
- Q.4 A 21-inch diameter reinforced concrete column carries an axial dead load of 210 kips and an axial live load of 180 kips. Design a rectangular footing for this column load if one side of the footing is limited to 9 ft. the depth of footing is 4 ft. Adopt $f'_c = 4,000$ psi, $f_y = 60,000$ psi. The safe bearing pressure of soil is 4.5 ksf. 11.67

SECTION-B

- 2 slab {
- Q.5 (a) Prove that a slab can be designed as a one-way slab if the long to short span ratio of the slab is larger than 2.0. 3.00
- (b) A square RC slab 10'x12' is supported on brick walls on all four sides is to be designed for its self weight only. Design completely the slab assuming $f'_c = 4,000$ psi and $f_y = 60,000$ psi. Draw reinforcement details. Follow WSD method. 8.67
- 2 way slab {
- Q.6 (a) Explain with necessary examples the concept of collapse mechanism. 3.00
- (b) A rectangular concrete slab of 12x20 ft is continuous on all four sides has a yield moment capacity 4000 lb-ft for positive moment and 5000 lb-ft for negative moment. Compute the ultimate load carrying capacity of the slab. 8.67
- WF {
- Q.7 (a) Discuss with sketch different types of single column footing. Draw pressure diagram under footing for different types of soils. 3.00
- (b) Design a reinforced concrete footing for a masonry wall 10 inch thick carrying a load of 12 kips per foot. The safe bearing capacity of soil is 3000 psi. Assume $f'_c = 4,000$ psi, $f_y = 50,000$ psi. Use WSD method. 8.67

- RW {
- Q.8 Design a cantilever retaining wall to retain 18 ft high earth bank using $\phi = 28^\circ$, $f = 0.6$, $q_s = 6000$ psf, $f'_c = 4$ ksi, $f_y = 24$ ksi and $\gamma_{soil} = 110$ pcf. 11.67

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CE 317
 Reinforced Concrete-II

Full marks: 70

Time: 3 Hours

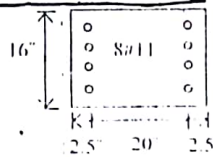
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SECTION-A

A flat slab floor system with panels 22 ft by 20 ft is supported on columns in both directions. Drop-panel is to be provided. Design a typical interior panel for a live load of 180 psf. Assume $f'_c = 4,000$ psi and $f_y = 20,000$ psi. 11.67

Why is it necessary to provide lateral reinforcement in columns? State the specifications for such reinforcements according to ACI code. 2.67

A column section is shown in figure below. Determine the load and corresponding moment for an eccentricity of 12 in assuming $f'_c = 5,000$ psi and $f_y = 60,000$ psi. 9.00



$\phi = 12$
 $c = 10$ mm

Define foundation. What are the essential requirements to be satisfied in the design of foundation? Explain, with diagram, different types of spread footings. 4.00

Design a reinforced concrete wall footing to support a 10 inch thick brick wall carrying a 15 kip/ft dead load and a 10 kip/ft live load. The base of the footing is 4 ft below grade. Use $f'_c = 3,000$ psi and $f_y = 60,000$ psi. 7.67

$q_u = 5,000$ psf. 4.00

Design a combined rectangular footing to support two columns as shown in the figure. The exterior column has a section 18 inch by 20 inch and carries a DL of 140 k and a LL of 140 k. The interior column has a section of 20 inch by 20 inch and carries a DL of 210 k and a LL of 150 k. The bottom of the footing is 5 ft below the grade. Assume $f'_c = 4,000$ psi, $f_y = 50,000$ psi and allowable soil pressure of 5,000 psf. 11.67



SECTION-B

Define column. What are the different types of column. Describe, with diagram, the behavior of identical tied and spiral column with the increase of load. 4.00

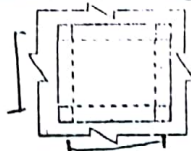
Design completely a spirally reinforced circular column to support an axial dead load of 450 kip and a live load of 200 kip using $f'_c = 4,000$ psi, $f_y = 60,000$ psi and steel ratio of about 2.78%. Apply USD method. 7.67

What is yield line analysis? State the assumptions made in the yield line analysis. What are the limitations of this method of analysis of slab? 3.00

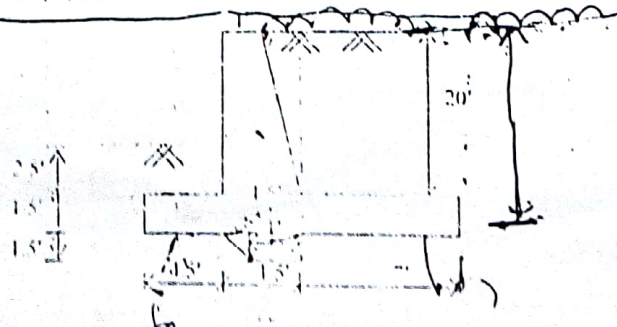
Find the ultimate load capacity of a 20 ft x 25 ft slab continuous on all edges, which have a yield moment of 2500 lb-ft for positive moment and 3500 lb-ft for negative moment. Neglect corner effect. 8.67

Why is it necessary to provide more reinforcement in the shorter direction of a rectangular two-way slab? Justify your answer with necessary derivation of equation. 3.00

An 8 ft x 10 ft slab panel as shown in figure 1, to be designed to support its own weight only. Design the slab and draw reinforcement details. Assume $f'_c = 3,500$ psi, $f_y = 20$ ksi, beam width 12". 8.67



A retaining wall section is shown in figure below. It is necessary to evaluate whether the section is adequate enough against the external forces. Assume (i) unit weight of soil = 120 pcf, (ii) surcharge = 600 psf, (iii) angle of internal friction = 32°, (iv) coefficient of friction between concrete and soil = 0.30. 11.67



AS
 column

WR

CR

col.
 slab

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 0.15
 RW

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Heaven's light is our Guide
DEPARTMENT OF CIVIL ENGINEERING
RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
 B.Sc. Engineering Third year Sixth Examination, 2011

CE 317
Reinforced Concrete - II

Time: 3 Hours

Full Marks: 70

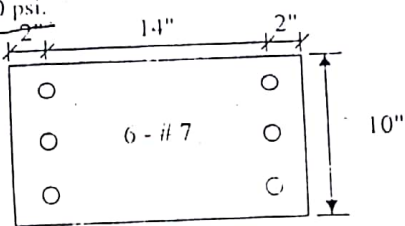
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 - (iv) Assume reasonable value for any data not given.

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SECTION-A

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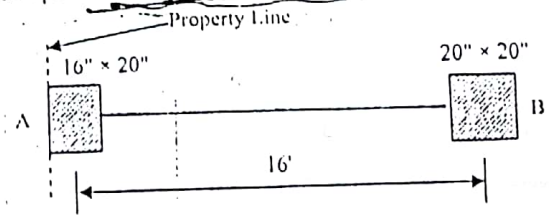
- Q.1) What are column capital and drop panel? State their functions. 2.00
- Q.2) Design an interior panel of a flat slab floor 21' x 21' with drop for a live load of 230 psf assuming $f'_c = 3,000$ psi, $f_s = 20,000$ psi. 9.67
- Q.3) Define foundation. Distinguish between shallow and deep foundation. 3.00
- Q.4) Design a wall footing for a 10 inch brick wall carrying a service load of 6 k/ft dead load and 10 k/ft live load using $f'_c = 3,000$ psi, $f_s = 60,000$ psi and allowable soil pressure $q_a = 4000$ psf. 8.67
- Q.5) An 18 in x 10 in concrete column is reinforced with 6 - # 7 bars as shown in the figure. Determine the failure load for an eccentricity of $e = 13$ inch, using material properties with $f'_c = 4,000$ psi and $f_s = 60,000$ psi. 11.67



- Q.6) A combined rectangular footing supports two column loadings as shown in the figure. The loadings are:

Column	Dead Load (kip)	Live Load (kip)
A	175	100
B	275	150

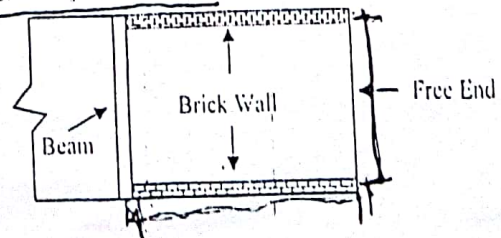
Proportion the dimension of the footing. Assume depth of footing = 5', $q_a = 4000$ psf, $f'_c = 3,000$ psi, $f_s = 60,000$ psi. Find reinforcement in the longitudinal direction.



SECTION-B

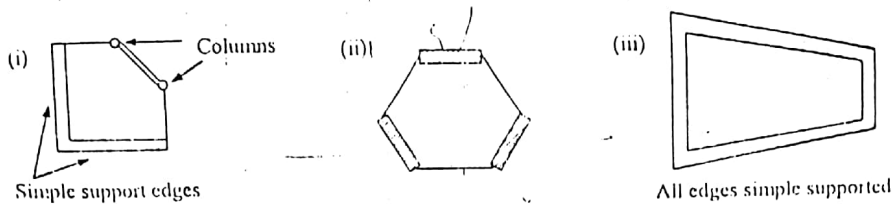
2 slab

- Q.7) Design balcony slab 10ft by 10ft to support a live load of 100 psf. The slab is supported on brick walls on two opposite sides and on a beam on the third side as shown in figure below. Assume $f'_c = 3,000$ psi and $f_s = 18,000$ psi. 11.67



- Q.6a) Define collapse mechanism. Explain it with an example.
 b) Draw yield lines for the following structures:

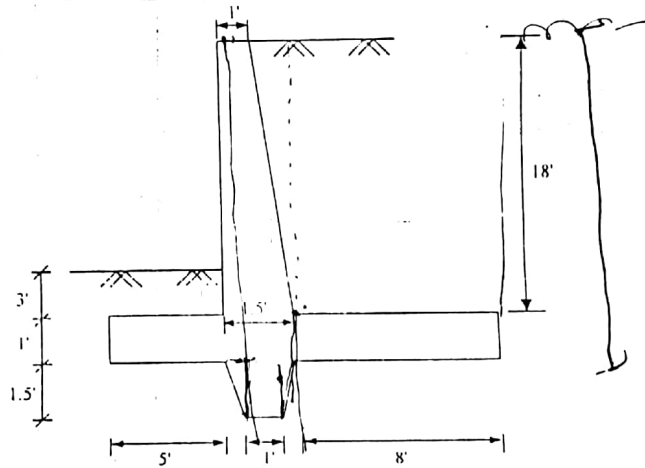
2.67
3.00



Q.7 A 10 ft x 10 ft slab is fixed on four sides and has negative moment capacity of 3 k-ft/ft and positive moment capacity of 2 k-ft/ft. Compute the load 'w' corresponding to failure of this slab. 6.00

Q.7a) State the functions of lateral reinforcement. Write their specifications. 3.00
 b) Design completely a circular reinforced concrete column to support a concentrated total load of 420 kips using WSD method. Data: $f_c = 3,000$ psi, $f_y = 60,000$ psi, $f_s = 24,000$ psi. 8.67

Q.8 A retaining wall section is shown in figure below. Compute the factor of safety against sliding and overturning. Assume (i) unit weight of soil = 120 pcf, (ii) surcharge = 300 psf, (iii) angle of internal friction = 30° (iv) coefficient of friction between concrete and soil = 0.5. 11.67



CE-09

CE 317
 Reinforced Concrete - II

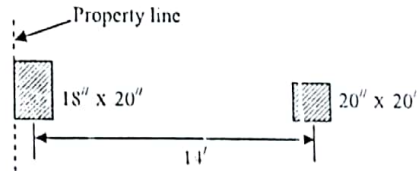
Full Marks: 70

Time: 3 Hours

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SECTION-A

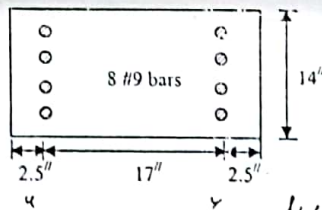
- col { Q.1(a) Explain the behavior of reinforced concrete tied and spiral columns. 2.67
 (b) Design completely by USD method a circular spiral column to support an axial dead load of 250 kip and a live load of 150 kip using $f'_c = 4$ ksi, $f_y = 60$ ksi. Assume $\rho_s = 2.5\%$. 9.00
- Q.F { Q.2 Find dimensions of a rectangular combined footing to support two columns as shown in the figure. The exterior side of the exterior column touches the property line. The centre to centre distance of columns is 14 ft. The exterior column with 18 x 20 in. size carries an axial dead load of 160 kip and a live load of 140 kip. The interior column with 20 in. square in size carries an axial dead load of 240 kip and a live load of 150 kip. The depth of footing is 5 ft. Use $f'_c = 4$ ksi, $f_y = 50$ ksi and $q_a = 5$ ksf. 11.67



- FP { Q.3 Design a 17ft by 19ft interior panel of a flat plate floor system to support a live load of 100 psf exclusive its own weight using $f'_c = 4000$ psi, $f_y = 60,000$ psi. Assume 18-in square column. 11.67
- FS { Q.4 Design an interior panel of a flat slab 21ft x 21ft with drop-panel for a total load of 300 psf including self weight. Use $f'_c = 3000$ psi, $f_y = 20,000$ psi. 11.67

SECTION-B

- col { Q.5 Determine the nominal compressive strength P_n and the corresponding moment M_n for the column section shown in the figure below if the eccentricity $e = 16$ inch. Take $f'_c = 4000$ psi and $f_y = 60,000$ psi. 11.67



- 2 Slabs { Q.6(a) A slab with long to short span ratio larger than two should be designed as one-way slab- explain. 3.00
 (b) Design a two-way isolated slab panel of size 12ft by 18ft. Assume (i) All sides are supported on simple supports (ii) Dead load = 30 psf (iii) Live load = 80 psf (iv) $f'_c = 4$ ksi (v) $f_y = 60$ ksi. 8.67
- Q.7(a) Briefly explain the concept of "collapse mechanism" with example. 3.67
 (b) Enumerate the limitations of yield line theory. 2.00
 (c) A simply supported square slab has a positive moment capacity $m_x = m_y$. Compute the value of m required to support a uniform load w . 6.00
- RW { Q.8 A cantilever retaining wall is to be designed to retain a back fill 17ft high which will also support an additional surcharge of 420 psf. Determine the approximate size of the retaining wall without considering the stability factors. Also design the stem and heel based on your approximate section. Assume, unit weight of soil = 120 pcf, $f'_c = 3$ ksi, $f_y = 20$ ksi and $\phi = 33^\circ$. 11.67

- Q.1 What is retaining wall? Mention some practical examples of where they are used.
Q.2 A cantilever retaining wall is to be constructed to retain a 15 ft high backfill. Make a preliminary design and apply necessary check for stability of the retaining wall. Assume unit weight of soil = 120 pcf. Angle of internal friction = 30° . Coefficient of base friction = 0.5 and surcharge = 240 psf.

Class Test on CE 3217

Full Marks:20

Time: 20min

- Q.1 A concrete wall supports a total load of 22100 lb per ft. the allowable bearing pressure of soil 4 ksf. Design the footing for this wall, using 3000-psi concrete and yield strength of steel 50,000-psi.

Class test on CE 3217

11. Write the specification for lateral reinforcement of column. (05)
12. Design a circular spiral column to support a dead load of 200 kips and live load 175 kips use $f'_c = 3$ ksi and $f_y = 60$ ksi. (15)

CLASSTEST ON CE 3217

Time : 25 Min

Full marks : 20.

- Q.1 (a) Draw pressure diagram under an eccentrically loaded footing.
Q.1 (b) Design a square spread footing for the following conditions: service dead load is 350 kips, service live load is 275 kips. Soil density is 130 lb/ft³ allowable soil pressure is 4500 psf at 5 ft below the basement floor. Column is 18 in. square $f'_c = 3500$ psi and $f_y = 60000$ psi. Place bottom of the footing at 5 ft below floor level.

Class Test on CE 317

- Q.1 Define column. Describe different types of column. (05)
Q.2 In a six-storied building frame columns are spaced at 15 ft on centers. Design an interior column considering the following data and assumptions (i) slab thickness = 6 in. (ii) LL on slab = 100 psf. (iii) columns are located at the intersections of beams of size 12 in x 24 in. (iv) the column can be designed as an axially loaded column (v) $f'_c = 4000$ psi and $f_y = 60,000$ psi. Design the column using USD and WSD methods and compare your results. (15)

CLASSTEST ON CE 3217

Full marks : 20

Time : 30 Min

- Q.1 (a) Define flat slab. Write down function of a drop panel.
Q1 (b) Design an interior flat floor system of 18 ft by 18 ft, carries a service load 120 psf. The panel is supported by four columns at the edge with 3ft diameter column capital and the center to center distance of column is 18 ft. Assume column size 15 in. square, $f'_c = 3000$ psi and $f_y = 60000$ psi.

- Q.1 What is key? Write the functions of key.
Q.2 A cantilever retaining wall is to be constructed to retain a 20 ft high backfill. Make a preliminary design and apply necessary check for stability of the retaining wall. Assume unit weight of soil = 120 pcf. Angle of internal friction = 30° . Coefficient of base friction = 0.5 and surcharge = 240 psf.