



FACULTY OF ENGINEERING  
DEPARTMENT OF CIVIL ENGINEERING  
SECOND SEMESTER EXAMINATION  
(AUGUST 2018)  
2017/2018 ACADEMIC SESSION

**Course Title:** DESIGN OF STRUCTURES I

**Course Code:** CVE 308

*Exe*

HOD'S SIGNATURE

**Instructions:**

- 1) **Attempt any four Questions**
- 2) **Time Allowed: 3 hours**
- 3) **SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAMINATION**



**ELIZADE UNIVERSITY, ILARA-MOKIN**  
**FACULTY OF ENGINEERING**  
**DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING**  
**SECOND SEMESTER 2017/2018 EXAMINATIONS**  
**B.Sc (Civil Engineering) Degree Examination**

**Course Title:** DESIGN OF STRUCTURES I      **Course Code:** CVE 308

**Instruction:** Attempt ANY FOUR questions      **Units:** 3

**Time allowed:** 3 hours.

**Question 1 (25 marks)**

Design the bending and shear reinforcements of a simply supported beam with span  $L = 6$  m; having the following parameters: width  $b = 250$  mm; overall depth  $h = 800$  mm; concrete cover  $c = 80$  mm; assumed reinforcement diameter = 32 mm and  $d^1 = 60$  mm; the beam support the following uniformly distributed loads; Partition = 82.78 kN/m, Finishes = 10 kN/m, self – weight, and imposed load  $q_k = 40$  kN/m. The characteristics material strength are  $f_{cu} = 40$  kN/mm and  $f_y = 460$  kN/mm,  $f_{yv} = 250$  kN/mm.

**Question 2 (25 marks)**

The structural layout in Figure Q2 is a suspended floor of a proposed block of flat for Elizade University Staff Quarters, calculate the bending reinforcement and check the deflection for;

a) Slab Panel 1 (13 marks)

b) Beam 2 (12 marks)

Given:  $f_{cu} = 30$  N/mm<sup>2</sup>;  $f_y = 460$  N/mm<sup>2</sup>; cover to be 25mm; imposed load  $q_k = 20$  kN/m; assuming Y12 and Y20 bars are to be used for slab and beam reinforcement respectively.

**Question 3 (25 marks)**

a) Explain different types of slab and their application in structural engineering (13 marks)

b) With reference to the structural layout in Figure Q2; calculate (6 marks)

i) the bending reinforcement and (6 marks)

ii) check the deflection of slab panel 2 (6 marks)

**Question 4 (25 marks)**

a) With reference to the structural layout in Figure Q2; calculate the effective width of

i) Beam 1 and (1 mark)

ii) Beam 4 if they are to be designed as flanged sections (1 mark)

b) Discuss limit state method of design (9 marks)

c) Explain the following terms (4 marks)

i) Braced and Unbraced Column

ii) Short and slender Column

- d) Determine if the braced column shown in Figure Q4 is short or slender. Given:  $h = 400\text{mm}$ ;  $b = 200\text{mm}$ ;  $S_r = 150\text{mm}$  and  $B_r = 400\text{mm}$ . For end condition 1 of Table 3.19 (BS 8110 – 1997)  $\beta = 0.75$  (10 marks)

Question 5 (25 marks)

- a) Explain the following terms
- Partial factor of safety and state its importance (4 marks)
  - Dead load, Imposed Load and Wind load (4 marks)
  - Building regulations and code of practice (4 marks)
- b) Design the longitudinal reinforcement for a 200mm square column which supports an axial load of 1700kN at the ultimate limit state. The characteristic material strengths are  $f_y = 460\text{N/mm}^2$  for reinforcement and  $f_{cu} = 30\text{N/mm}^2$  for the concrete. (13 marks)

Question 6 (25 marks)

- State the factors affecting choice of reinforced concrete for a structure? (5 marks)
- Itemize various structural elements in a building structure (5 marks)
- Explain the working principle of reinforced concrete (5 marks)
- Explain the stages required in structural design process (5 marks)
- What is characteristic and design strength? (5 marks)

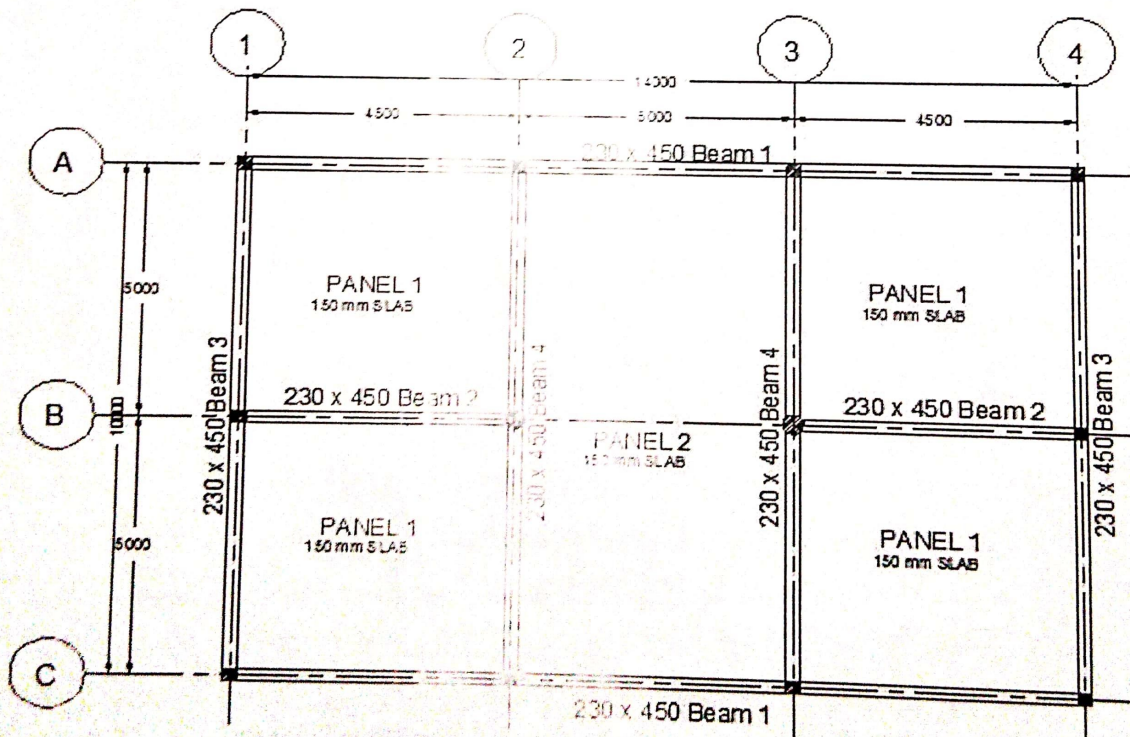


FIGURE: Q2

FIGURE Q2: STRUCTURAL LAYOUT

- d) Determine if the braced column shown in Figure Q4 is short or slender. Given:  $h = 400\text{mm}$ ;  $b = 200\text{mm}$ ;  $S_r = 150\text{mm}$  and  $B_r = 400\text{mm}$ . For end condition 1 of Table 3.19 (BS 8110 - 1997)  $\beta = 0.75$  (10 marks)

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  - Dead load, Imposed Load and Wind load (4 marks)
  - Building regulations and code of practice (4 marks)
- b) Design the longitudinal reinforcement for a 200mm square column which supports an axial load of 1700kN at the ultimate limit state. The characteristic material strengths are  $f_y = 460\text{N/mm}^2$  for reinforcement and  $f_{cu} = 30\text{N/mm}^2$  for the concrete. (13 marks)

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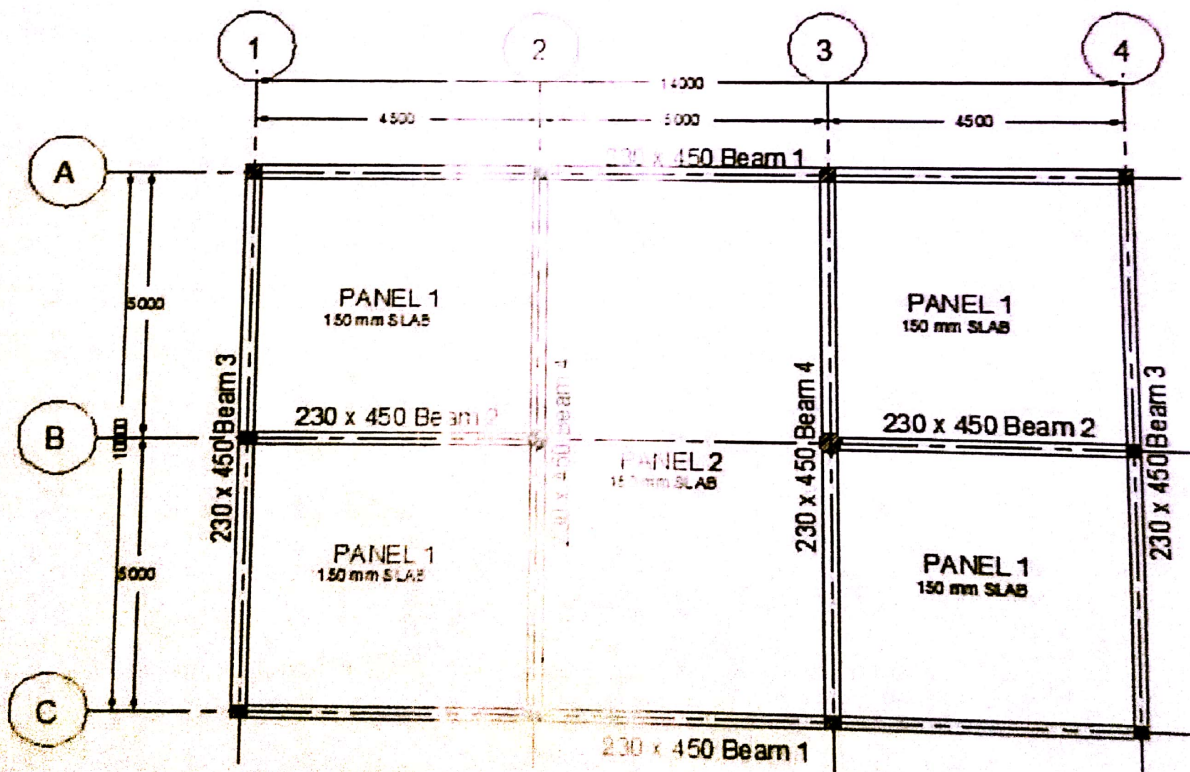


FIGURE: Q2

FIGURE Q2: STRUCTURAL LAYOUT

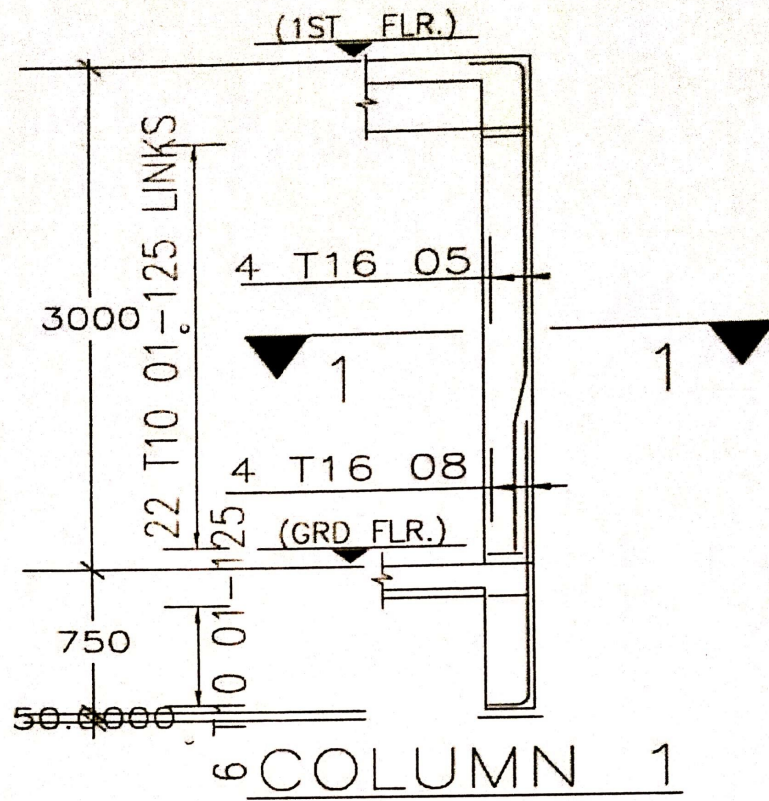


Figure Q4: COLUMN