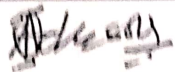# FACULTY OF ENGINEERING

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

Course Title: Design of Structures III

Course Code: CVE 508

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

INSTRUCTION: Answer Any FOUR Questions   **Time Allowed: 3Hrs**

Question 1 (25 marks)

a. The single-span, simply-supported beam shown in Figure Q1 carried the loads as shown. Taking the losses to be 25% and permissible tensile stresses are 2.5 N/mm² and 2.0 N/mm² in service. Also, permissible compressive stress are 20 N/mm² at transfer and at service. Determine an appropriate rectangular section for the member taking the density of prestressed concrete to be 25 kN/m³.   **(20 marks)**
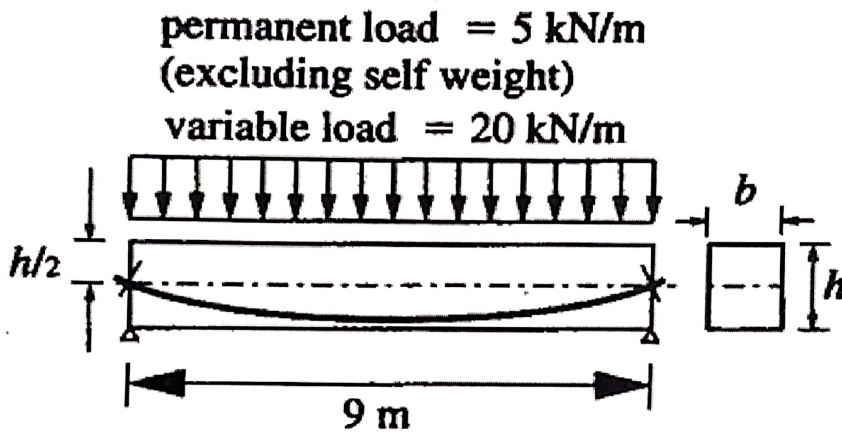
permanent load = 5 kN/m
(excluding self weight)
variable load = 20 kN/m

$h/2$

b

h

9 m

Figure Q1: Prestressed Beam

b. Mention five functional requirement of sound foundations for structures.   **(5 marks)**

Question 2 (25 marks)

a. The central column 300x300 mm of a three storey Faculty of Art building supports a roof/floor area of 4.225 m x 3.825 m. Take the building as an educational type with live load of 3.0kN/m² and roof load (ultimate dead and live) as 2.5 kN/m² and design the foundation base to the column using 25 - 410 concrete. Assume the soil safe bearing pressure or allowable bearing capacity P_b = 150 kN/m².   **(17 marks)**

b. Write short note on different types of raft foundation. Diagrams are very vital. **(8 marks)**

Question 3 (25 marks)

a. In Senate Building, two columns 225 x 225 mm each carrying 500 and 250 kN load respectively. They are 1.2 m apart and the soil bearing pressure is 150 kN/m². Design a single combined base for the two columns using 25 - 410 concrete and take the concrete permissible shearing stress as 0.4 N/mm².   **(16 marks)**

b.   List five causes of ground and foundation movement.   **(5 marks)**

c.   List eight uses of prestressed concrete.   **(4 marks)**

Question 4 (25 marks)

a. What are the advantages of prestressed concrete over normal reinforced concrete.   (5 marks)

b. In chronological order, itemise various steps entailed in designing an isolated pad footing. (15 marks)

c. Sketch three typical cross-section of composite beams.   (5 marks)

Question 5 (25 marks)

a. The bored pile working loads is displayed in Table Q5. Using the information supplied in Table Q5, design a pile cap for the column of size 300 x 300 mm. The central column carries total service load of 650kN comprising 390 kN (dead and 260kN (live). The soil bearing capacity is very low and the land is swampy. Use concrete of grade 25 - 410.   (20 marks)

b. List sources of prestress losses in prestressed concrete.   (5 marks)

Question 6 (25 marks)

a.   Two columns (A 300 x 300 and B 225 x 225 mm) spport ultimate loads of 400 and 250 kN respectively. The columns are 1.5m from each other. Design a combined base on piles for the two columns. Use a global factor of 1.5 and 25 - 410 concrete and Table Q5.   (20 marks)

b.   What are the advantages of using composite structures over complete reinforced concrete structure.(5 marks)

Table Q5: Bored pile working load in kN

Pile Size (mm)	End Resistance	Skin Resistance	Working Load
300	92	24	116
450	208	35	243
600	368	47	416
800	656	63	719