Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2019/2020

COURSE NAME	:	REINFORCED CONCRETE DESIGN II
COURSE CODE	:	BFC32803
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JULY 2020
DURATION	:	6 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS 2. DESIGN SHOULD BE BASED ON BS EN 1990:2002+A1:2005, BS EN 1991-1-1:2002, BS EN 1992-1-1:2004

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

Q1 **Figure Q1(a)** shows a plan view of an unbraced frame building that will be constructed at hilly area. Side elevation of the building is shown in **Figure Q1(b)** and exposed to open terrain with few or no obstructions. The wind load is non-linear, windward wall permeable and varies at different height, depending on the value of $\rho = 0.613(V_s)^2(M_{z,cat})^2(C_{p,e}-C_{p,i})$ kN/m according to MS 1553:2002. If the wind load is imposed at the right of reinforced concrete building,

(a) Calculate the possible V_s, $M_{z,cat}$, $C_{p,e}$ and $C_{p,i}$ for this frame system by using simplified procedure.

(5 marks)

(b) Determine and draw the distribution of wind load of the frame consisting Beam B/1-4 at each level as shown in plan view.

(9 marks)

(c) Analyse and draw the axial and shear forces in beams and columns at Level F.

(11 marks)

Q2 (a) **Figure Q2(a)** illustrates **TWO (2)** different types of column. Explain in details each types of column (i) and (ii) based on the support conditions.

(5 marks)

(b) A plan and front elevation of a braced concrete structural frame is given in **Figure Q2(b)**. The column size is 225 mm x 350 mm extending from the footing to second floor. All beams are 175 mm x 500 mm. The following data are given:

Uniformly distributed load on beam 1 inclusive self-weight;

Characteristic dead load	= 25 kN/m
Characteristic live load	= 15 kN/m

Uniformly distributed load on beam 2 inclusive self-weight;

Characteristic dead load	= 22.5 kN/m
Characteristic live load	= 10.5 kN/m
Characteristic strength of concrete	= 25 N/mm^2
Characteristic strength of steel	= 500 N/mm^2
Concrete cover	= 25 mm

(i) Determine the ultimate moment Myy, Mzz and ultimate axial load N at column A from footing to first floor. Given the column A carries the total ultimate axial load of 150 kN from second and third floor.

(15 marks)

(ii) Calculate the effective height, Lc of column A about Z and Y axis.

(5 marks)

Q3 (a) The type of foundation to be used depends on several factors. List **THREE (3)** general factors that affect the foundation selection and most economical type to be used.

(3 marks)

(b) A pile foundation needs to be designed for a shop lot building that will be constructed at soft soil area. It is requires to support a permanent axial action of 3600 kN and variable action of 2400 kN. Based on **Figure Q3** and the following data given:

Characteristic strength of concrete, f_{ck}	= C35/45
Characteristic strength of steel, f_{yk}	= 500 N/mm^2
Unit weight of concrete	= 25 kN/m^3
Assume diameter of reinforcement, $\emptyset_{bar}$	= 32 mm
Nominal concrete cover, c	= 75 mm
Column size	= 500 mm x 500 mm
Pile: Prestressed Micro pile	= 400 mm diameter
Service load	= 2000 kN

(i) Determine the required number of pile and size of the pile cap.

(6 marks)

(ii) Draw the size of pile cap with all dimensions and design the main reinforcement of the pile cap.

(9 marks)

(iii) Verify the shear resistance of the pile cap.

(7 marks)

Q4 (a) Describe **FOUR (4)** different types of concrete retaining walls.

(4 marks)

(b) **Figure Q4** shows the cross section of retaining wall with loads acted on the retaining wall. The wall is to be cast into the foundation soil to the depth of 0.5 m and will retain a granular fill to a height of 3.5 m without any surcharge.

(i) Check the stability of the retaining wall based on sliding, overturning and settlement. Given unit weight of concrete = 25 kN/m^3, safe bearing pressure = 200 kN/m^2 and friction coefficient = 0.45.

(7 marks)

(ii) Determine the bending moment of the wall, footing and the main reinforcements of the wall and footing. Given; cover = 40 mm, f_{ck} = 30 N/mm^2, f_{yk} = 500 N/mm^2, f_{ctm} = 2.9 N/mm^2).

(9 marks)

(iii) Predict the effect of reinforcement and stability if toe inserted at the edge of the retaining wall

(5 marks)

END OF QUESTIONS –

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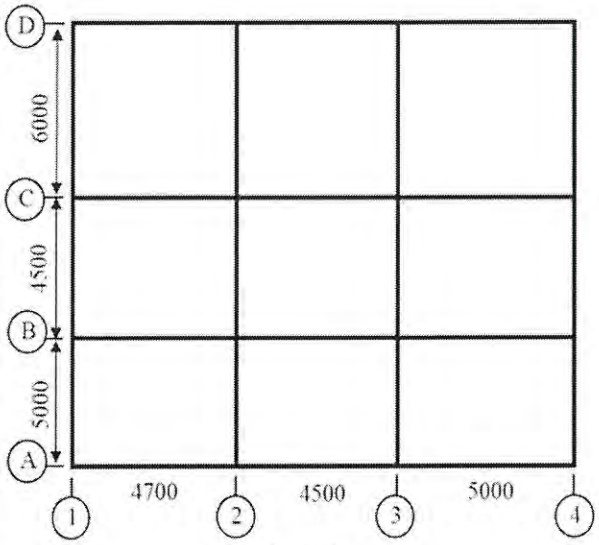

FIGURE Q1(a)

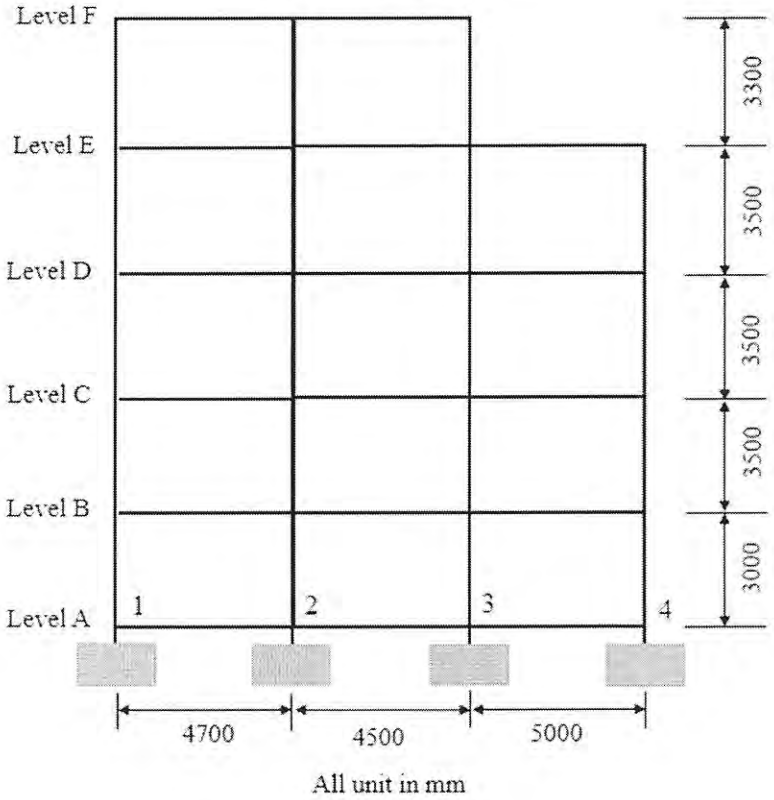

FIGURE Q1(b)

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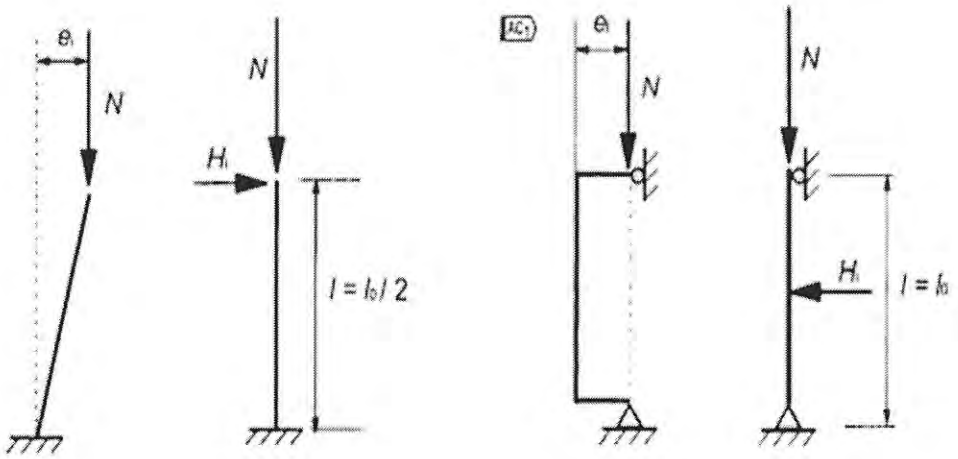

(i) **(ii)**

FIGURE Q2(a)

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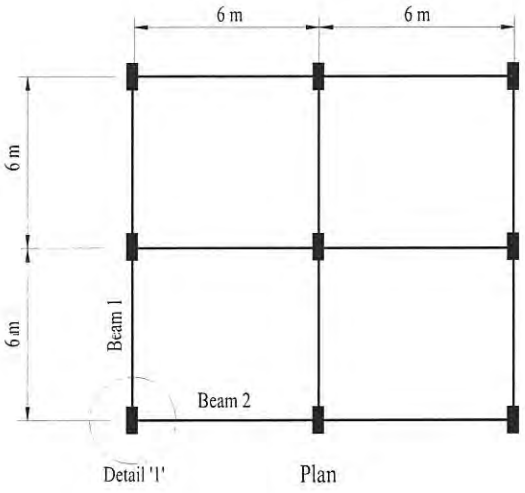

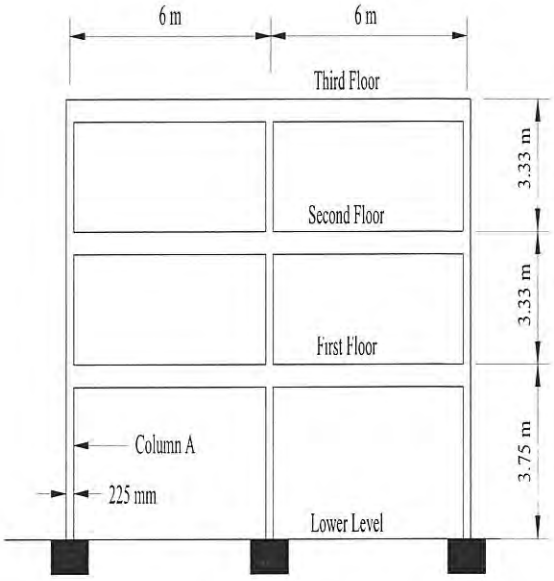

Front Elevation

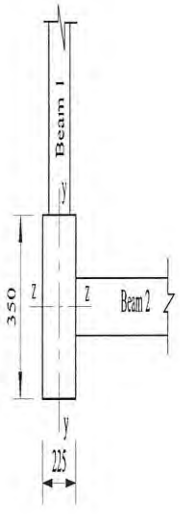

FIGURE Q2(b)

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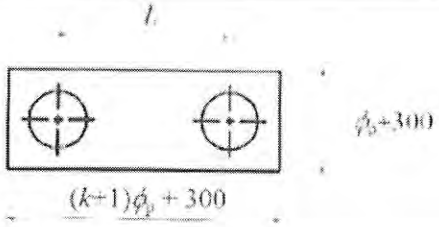
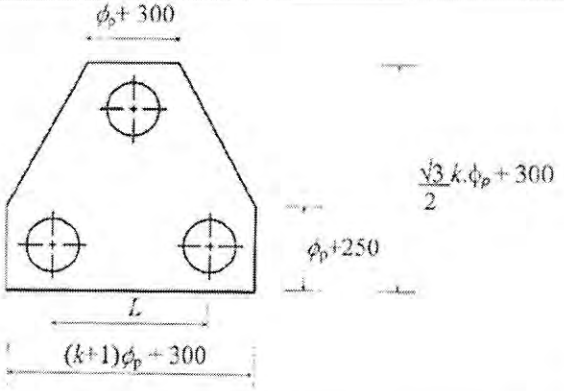
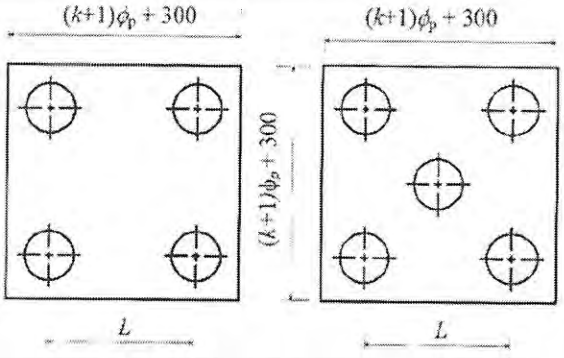
Number of piles	Dimension of pile cap	Tensile force
2		NL / 4d
3		NL / 9d
4		NL / 8d
5		NL / 10d

Notation : N = Axial load, σ_p = size of pile, d = effective depth, k = spacing factor of pile

FIGURE Q3

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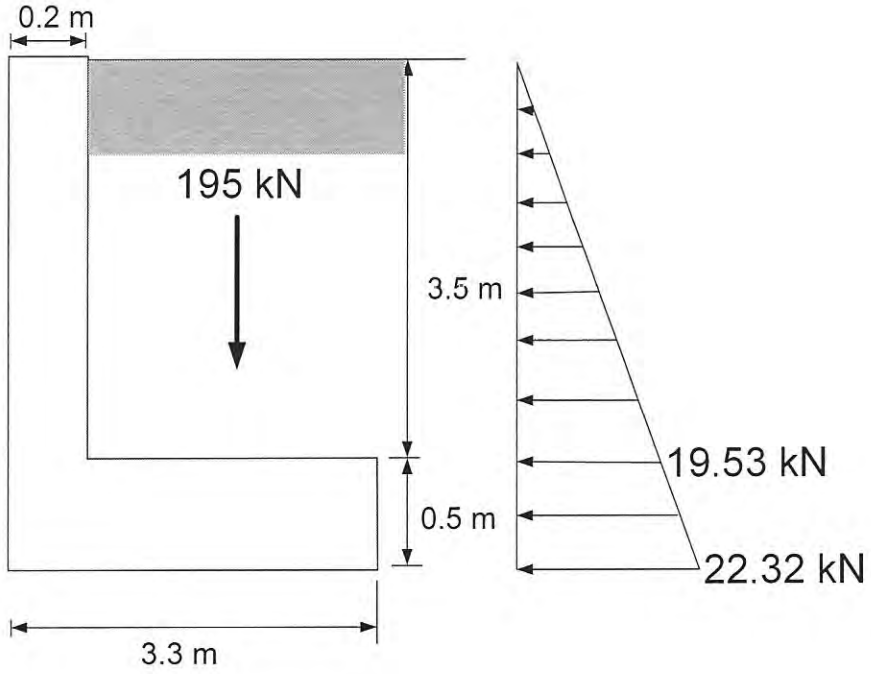

All unit in mm

FIGURE Q4