Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2021/2022

COURSE NAME	:	REINFORCED CONCRETE DESIGN
COURSE CODE	:	BFC 34803
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JULY 2022
DURATION	:	3 HOURS
INSTRUCTION	1.	ANSWER ALL QUESTIONS
	2.	THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **OPEN BOOK.**
	3.	DESIGN SHOULD BE BASED ON BS EN 1990:2002+A1:2005, BS EN 1991-1-1:2002, BS EN 1992-1-1:2004, MS 1553:2002

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 **Figure Q1** shows the side view of three story an office building with irregular frame will be built at coastal area near Desaru, Johor. The frame is exposed to open terrain with few or no obstructions. The wind load is non-linear, one windward wall permeable and varies at different height.

(a) According to MS 1553:2002, if the wind load is imposed at the x-direction, determine the design wind pressure and wind load for building by applying suitable method. All beams dimension for plan view is 4000 mm.

(10 marks)

(b) Analyse the axial and shear forces in beams and columns at Level 3.

(10 marks)

(c) If the frame is to be analysed by using analytical method, calculate and draw the possibility value of leeward wall. Then, explain the importance of windward wall and leeward wall in frame analysis. (Assume $\alpha = < 10°$, $V_{des} = 37$ m/s, $C_{dyn} = 1.00$)

(5 marks)

Q2 **Figure Q2** shows a braced frame structure of a laboratory building. The connection between column is fixed at top and bottom. Bending moments for column B are M_y = 15 kNm (top) and 20 kNm (bottom) at negative and positive side respectively. Use concrete strength, f_{ck} = 25 N/mm^2.

(a) Calculate the design ultimate axial load for column B. Assume 4.5 m for beam span on z-direction to support the following floor loads.

(6 marks)

(b) Classify column B either short or slender based on BS EN1992-1-1:2004.

(14 marks)

(c) Calculate the possible design bending moment for column B by considering given M_y for both sides.

(5 marks)

Q3 A double storey shop building will be constructed at Taman Puteri, Parit Raja. A pad footing is proposed to support axial load of 1650 kN and 750 kNm clockwise bending moment. Given the following data,

Column size	=	300 mm x 350 mm
Characteristic strength of concrete, f_{ck}	=	35 MPa
Characteristic strength of steel, f_{yk}	=	500 N/mm^2
Unit weight of concrete	=	25 kN/m^3
Assume diameter of reinforcement, $\emptyset_{bar}$	=	20 mm
Nominal concrete cover, c	=	35 mm
Design load to service load factor	=	1.5
Soil bearing capacity	=	150 kN/m^2

(a) Determine the required size for the pad footing.

(10 marks)

(b) Design the longitudinal and transverse reinforcement of the pad footing.

(10 marks)

(c) Check the maximum punching shear at column perimeter

(5 marks)

Q4 A reinforced cantilevered wall as shown in **Figure Q4** is proposed to hold back a 4 m high sandy soil bank. The surface of the soil behind the proposed wall is level. Given the following data,

Characteristic strength of concrete, f_{ck}	=	30 MPa
Characteristic strength of steel reinforcement, f_{yk}	=	500 MPa
Unit weight of reinforced concrete	=	25 kN/m^3
Concrete cover	=	50 mm
Safe bearing pressure, q	=	300 kN/m^2
Concrete cover	=	45 mm
Bar diameter	=	16 mm
Cohesion, c	=	0
Friction with concrete coefficient, μ	=	0.45
Moment		
Permanent action due to wall and soil	=	531 kNm
Permanent action due to soil active pressure	=	133 kNm
Variable action due to wall and soil	=	43 kNm
Variable action due to surcharge active pressure	=	38 kNm
Vertical load, V_k		
Permanent action	=	278 kN
Variable action	=	20 kN
Horizontal load, H_k		
Permanent action	=	76 kN
Variable action	=	14 kN

(a) Analysis the stability of the overturning, sliding and settlement

(10 marks)

(b) Design the main reinforcement in the wall and base

(15 marks)

-END OF QUESTIONS -