UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	STRUCTURAL DESIGN
COURSE CODE	:	BPD 30802
PROGRAMME CODE	:	BPC
EXAMINATION DATE	:	DECEMBER 2018 / JANUARY 2019
DURATION	:	2 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

TERBUKA

Q1   (a)   Explain stress-strain relationship for concrete and steel in reinforced concrete design.

(5 marks)

        (b)   **Figure Q1** in Appendix 1 shows a first floor plan of double storey house. The concrete slabs and beams are poured together and the thickness of slab is 150mm. All beams size are 250mm x 450mm. The permanent and variable actions for all slabs are as in **Table Q1**.

Table Q1 Actions

Ceiling and tile finishes	$2.5kN/m^2$
Variable action	$3.0kN/m^2$
Concrete strength class	C30/37
Characteristic strength of steel, f_{yk}	$500N/mm^2$
Concrete cover	30mm

            i)   Calculate:-

                (a) Design action of slab S2.

(6 marks)

                (b) Positive and negative moments of slab S2.

(8 marks)

                (c) Minimum and maximum area of reinforcement for slab S2.

(6 marks)

            ii)   Design the flexural reinforcement required at mid span of slab S2. Assume bar size is 12mm.

(12 marks)

   iii)   Sketch the cross section of slab S2 with the arrangement of reinforcement.

(3 marks)

Q2   (a)   Describe **THREE (3)** steel sections suitable to be used as column.

(6 marks)

(b)   Explain why circular hollow section (CHS) is the best section to be used as column.

(5 marks)

(c)   A pinned ended steel column 305 x 305 x 97 UC with grade S275 as shown in **Figure 2** as in Appendix 2 is loaded with factored load 2500kN. A tie beam at mid height of the column provide restraint in y-y axis.

i)   Analyze the classification of the section

(6 marks)

ii)   Analyze the adequacy of the column according to BS EN 1993-1-1.

(13 marks)

Q3   (a)   Discuss with example the laterally restrained beam.

(6 marks)

(b)   Outline the classifications of cross sections.

(8 marks)

(c)   A beam, simply supported over an effective span of 8m, carries a uniformly distributed load (UDL) of 90kN/m, inclusive of self-weight. The depth of the beam is restricted to 500mm.

Design the beam assuming that the compression flange of the beam is laterally supported by floor construction by verifications of shear resistance, bending resistance and vertical deflection. Use grade steel S275.

(16 marks)

- END OF QUESTIONS –

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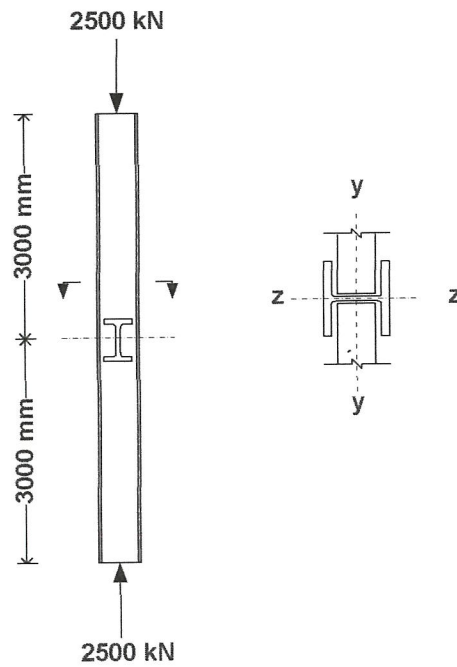COURSE NAME   : STRUCTURAL DESIGN   COURSE CODE: BPD 30802
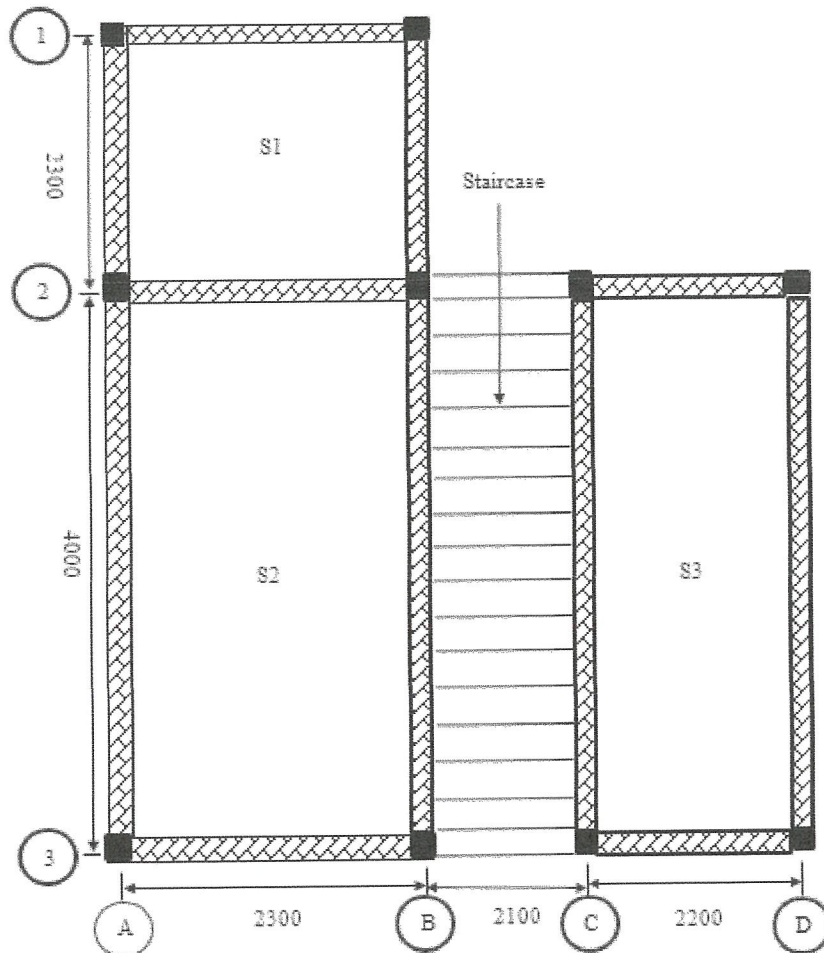
Figure Q1

(First Floor Plan of a Double Storey House)

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Figure Q2

(A Pinned Ended Steel Column)