Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2013/2014

COURSE NAME	:	ADVANCED STRUCTURE DESIGN
COURSE CODE	:	BFS 40903
PROGRAMME	:	4 BFF
EXAMINATION DATE	:	DECEMBER 2013/ JANUARI 2014
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1 (a) A simply supported girder is imposed with a uniform load and point load as shown in Figure **Q1 (a)** and is laterally restrained throughout its length. The selected initial trial section of the girder is as shown in Figure **Q1 (b).** The grade of the steel and the stiffener is S275.

(i) Classify the flange and web section
(ii) Check the moment capacity

(15 marks)

(b) Based on stiffener placement in Figure **Q1 (c)**:

(i) Check stiffener at B as bearing stiffener.

Try stiffener 2 flats 450 mm x 40 mm grade S275

(10 marks)

Q2 (a) Describe **Two (2)** methods that can be used to design water retaining structures.

(2 marks)

(b) **Three (3)** specific cases can be used to calculate the crack width. Describe all these cases.

(3 marks)

(c) Figures **Q2 (a)** shows a cross section of water retaining structure. Determine a suitable thickness and reinforcement arrangement using the following data: concrete grade, C35, $f_{yk} = 500$ N/mm^2, cover 40 mm, water density = 10 kN/m^3, partial safety factor $\gamma_f = 1.4$, bar size = 16 mm.

(20 marks)

Q3 (a) By using a sketch, describe **Four (4)** types of slab which are normally used in concrete structure.

(8 marks)

(b) A square panel of a floor slab (Figure **Q3**) is simply supported on four edges of the slab. If the length of the slab is L m, and the uniform design load is *w*, determine:

(i) The moment of the slab using the yield line methods.
(ii) If L = 6 , w is 13 kN/m^2, and the thickness of the slab is 175 mm. Design the main reinforcement. The materials are grade 30 for concrete and grade 500 for reinforcement.

(17 marks)

Q4 (a) A plan and elevation view of the concrete structure is shown in Figure **Q4** with the base is designed to carry moment. The dead load and imposed load on the roof is 5 kN/m^2 and 1.5 kN/m^2, while on the floor is 6 kN/m^2 and 2.5 kN/m^2 respectively. The wall is 160 mm thick.

(i) Classify the wall if the top of the wall is connected to the ribbed slab with 350 mm deep.

(5 marks)

(ii) Design the wall without taking account of the column at the ends and the wall only carries load from roof and slab on every floor. Given data: f_{ck} = 30 N/mm^2 and f_{yk} = 500 N/mm^2, column size 400 x 400 mm.

(15 marks)

(b) What do you understand about braced and unbraced structure?

(5 marks)

Q5 (a) By using a sketch, explain briefly a composite floor slab and composite beam.

(8 marks)

(b) A composite floor with beam at 3 m centers spanning 12 m. The composite slab is 130 mm deep. The floor is to resist an imposed load of 5 kN/m^2, partition load of 1.0 kN/m^2, ceiling load of 0.5 kN/m^2, beam self weight = 0.67 kN/m^2 and slab self weight = 2 kN/m^2. The floor is to be unpropped during construction. By using beam section 457 x 191 x 67 kg/m grade S275:

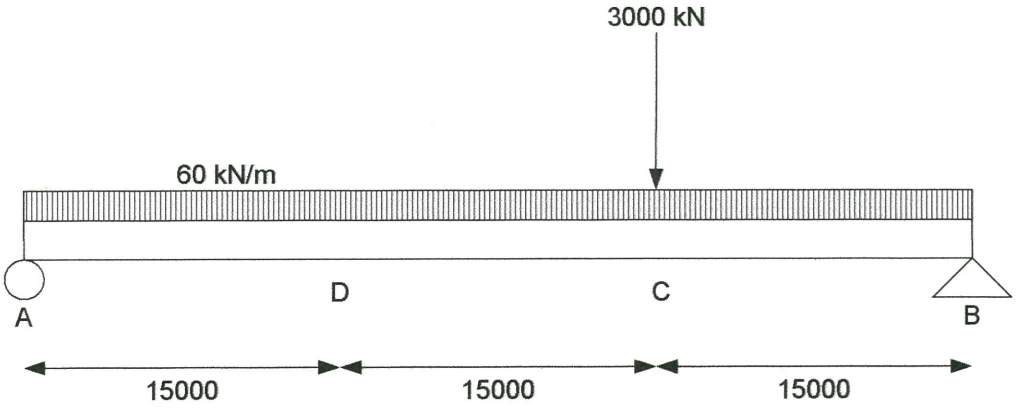
(i) Calculate the moment capacity of the beam
(ii) Check for shear connector. (A_{sv} = 0.95, f_{yk} = 500 N/mm^2)
(iii) Check the beam deflection.

(17 marks)

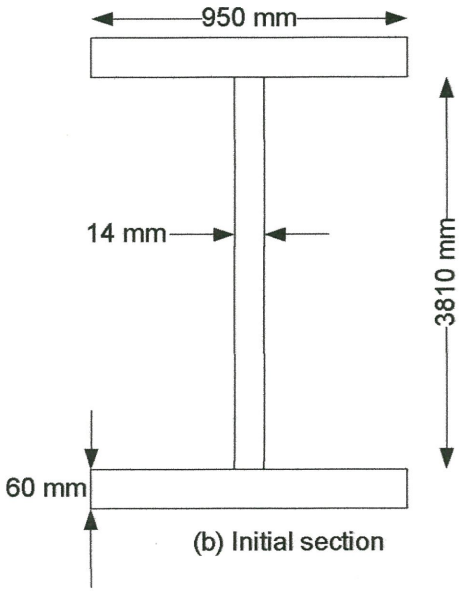
- END OF QUESTION -

FINAL EXAMINATION

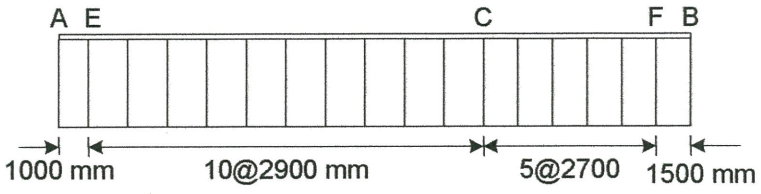
SEMESTER/SESSION: SEM I/2013/2014 PROGRAMME : 4 BFF
COURSE : ADVANCED STRUCTURE DESIGN COURSE CODE : BFS 40903



(a) Loading condition



(b) Initial section



(c) Stiffener spacing

FIGURE Q1

FINAL EXAMNATION

SEMESTER/SESSION: SEM I/2013/2014 PROGRAMME : 4 BFF
COURSE : ADVANCED STRUCTURE DESIGN COURSE CODE : BFS 40903

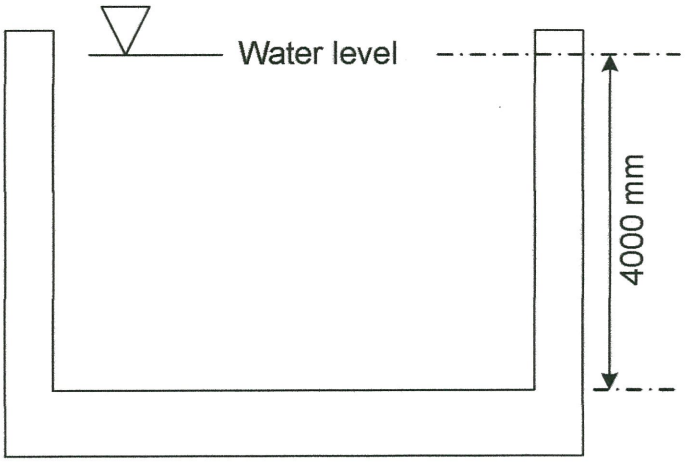


Table 3.2 Allowable ultimate shear force in slabs (kN/m). Grade 35 concrete

Steel ratio $100A_s$	Effective depth (mm)							
bd	140	190	240	330	430	630	730	920
0.17	71.3	89.6	106.8	135.6	168.4	246.7	285.9	360.3
0.25	81.1	101.9	121.5	154.2	191.5	280.6	325.1	409.8
0.50	102.1	128.4	153.0	194.3	241.3	353.5	409.6	516.3
0.75	116.9	147.0	175.2	222.4	276.2	404.7	468.9	591.0
1.00	128.7	161.8	192.8	244.8	304.0	445.4	516.1	650.5
1.50	147.3	185.2	220.7	280.2	348.0	509.9	590.8	744.6

Note: A_s is the area of steel that is fully anchored.

FIGURE Q2

FINAL EXAMINATION

SEMESTER/SESSION: SEM I/2013/2014 PROGRAMME : 4 BFF
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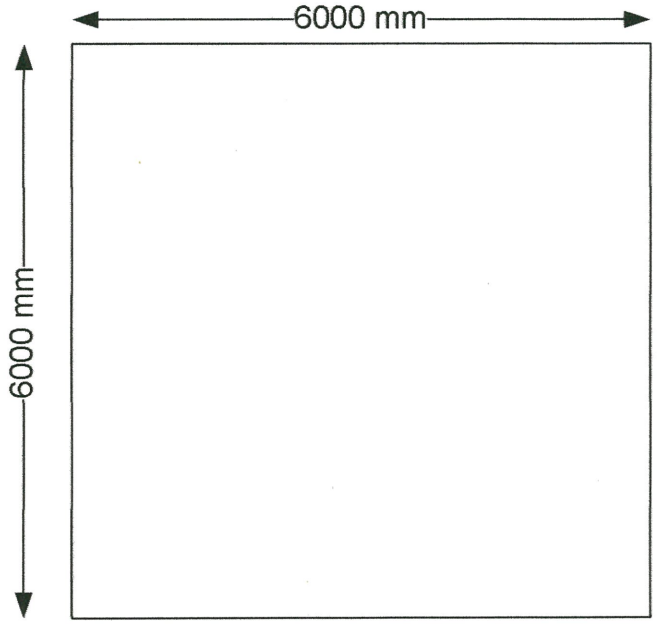
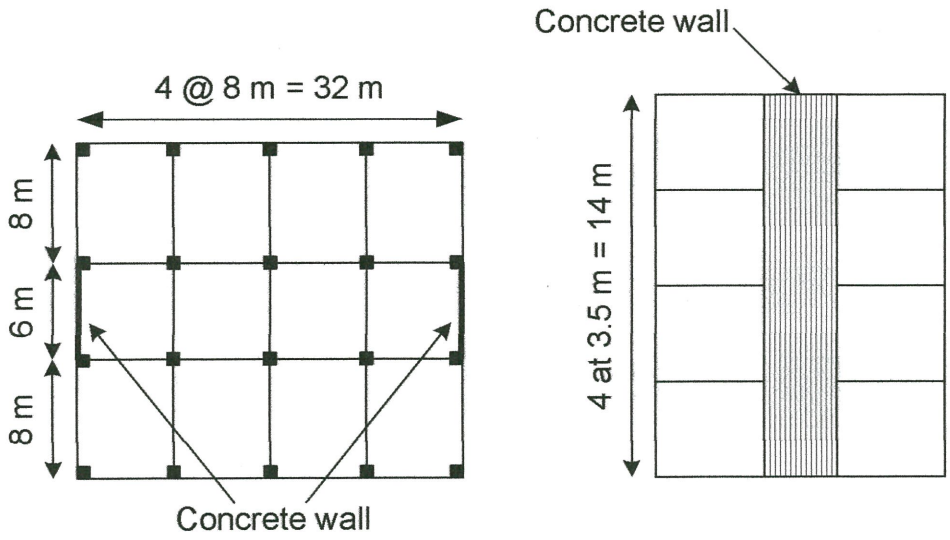


FIGURE Q3

FINAL EXAMINATION

SEMESTER/SESSION: SEM I/2013/2014 PROGRAMME : 4 BFF
COURSE : ADVANCED STRUCTURE DESIGN COURSE CODE : BFS 40903



i) Plan view ii) Side elevation

FIGURE Q4