UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2011/2012

COURSE NAME	:	ADVANCED STRUCTURE DESIGN
COURSE CODE	:	BFS 4093
PROGRAMME	:	4 BFF
EXAMINATION DATE	:	JUNE 2012
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **NINE (9)** 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 shown as 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, C35A, $f_y = 460$ 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 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 460 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_{cu} = 30 N/mm^2 and f_y = 460 N/mm^2, column size 400 x 400 mm.

(15 marks)

b) Determine effective height of the plain concrete wall for every floor based on the foundation condition as in Figure **Q4 (b)** and **(c)**.

(5 marks)

Q5 a) By using a sketch, explain briefly what are 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_y = 460 N/mm^2)
iii) Check the beam deflection.

(17 marks)

S1 a) Galang tersokong mudah dikenakan beban teragih seragam and beban tumpu seperti di dalam Rajah **Q1 (a)** dan ianya adalah terhalang sisi bagi keseluruhan rentang. Keratan permulaan yang dipilih ditunjukkan di dalam Rajah **Q1 (b).** Gred keluli dan pengukuh yang digunakan adalah S275.

ii) Kelaskan keratan bagi bebibir dan web.
iii) Kirakan kapasiti momen bagi keratan ini.

(15 markah)

b) Berdasarkan kedudukan pengukuh di dalam Rajah **Q1 (c)**:

ii) Semak plat pengukuh di B sebagai pengukuh galas.

Cuba 2 pengukuh rata 450 mm x 40 mm gred S275

(10 markah)

S2 a) Terangkan **Dua (2)** kaedah yang boleh digunakan bagi merekabentuk struktur penahan air.

(2 markah)

b) **Tiga (3)** keadaan boleh digunakan bagi mengira tebal keretakan. Terangkan ketiga-tiga keadaan tersebut.

(3 markah)

c) Rajah **Q2 (a)** menunjukkan keratan rentas struktur penahan air. Tentukan ketebalan dinding yang bersesuaian dan bilangan tetulang dengan menggunakan data- data berikut: konkrit gred, C35A, f_y = 460 N/mm^2, cover 40 mm, ketumpatan air = 10 kN/m^3, faktor keselamatan separa γ_f = 1.4, diameter bar = 16 mm.

(20 markah)

S3 a) Dengan menggunakan lakaran, terangkan **Empat (4)** jenis papak yang biasa digunakan untuk struktur konkrit.

(8 markah)

b) Panel papak segiempat sama (Rajah **Q3**) disokong mudah pada kesemua sisinya. Jika panjang papak ialah L m dan beban teragih seragam w dikenakan ke atas papak, tentukan:

i) Nilai momen maksimum dengan menggunakan kaedah garis alah.

ii) Rekabentuk tetulang utama bagi papak tersebut, Jika L = 6 m, beban rekabentuk muktamad ialah 13 kN/m^2, dan ketebalan papak ialah 175 mm. Bahan yang digunakan adalah gred 30 untuk konkrit dang red 460 untuk besi tetulang.

(17 markah)

S4 a) Pandangan plan dan sisi bagi struktur konkrit ditunjukkan di dalam Rajah **Q4** dengan keadaan asas direkabentuk untuk menanggung momen. Beban mati dan kenaan di atas bumbung ialah 5 kN/m^2 and 1.5 kN/m^2, manakala di atas papak ialah 6 kN/m^2 and 2.5 kN/m^2. Ketebalan dinding adalah 160 mm.

i) Kelaskan dinding konkrit jika bahagian atas dinding disambungkan kepada papak rib dengan ketebalan 350 mm.

(5 markah)

ii) Rekabentuk dinding konkrit dengan mengabaikan tiang dihujung dinding dan dinding hanya menanggung beban daripada atap dan juga papak dari setiap tingkat. Data yang diberikan: f_{cu} = 30 N/mm^2 and f_y = 460 N/mm^2, saiz tiang 400 x 400 mm.

(15 markah)

b) Tentukan panjang berkesan dinding konkrit tak bertetulang bagi setiap tingkat dengan merujuk kepada keadaan asas seperti di dalam Rajah **Q4 (b)** dan **(c)**.

(5 markah)

S5 a) Dengan menggunakan gambarajah, terangkan apakah yang dimaksudkan sebagai papak dan rasuk rencam.

(8 markah)

b) Papak rencam dengan jarak di antara rasuk ialah 3 m dan panjang 12 m. Ketebalan papak ialah 130 mm dan dikenakan daya kenaan 5 kN/m^2, beban partition = 1.0 kN/m^2 dan beban siling = 0.5 kN/m^2, berat sendiri rasuk = 0.67 kN/m^2, berat sendiri papak = 2 kN/m^2. Keadaan papak adalah tidak disokong semasa proses pembinaan. Dengan menggunakan keratan 457 x 191 x 67 kg/m gred S275:

i) Kirakan keupayaan momen bagi rasuk tersebut.
ii) Semak stud ricih.(A_{sv} = 0.95, f_y = 460 N/mm^2)
iii) Semak pesongan rasuk

(17 marks)

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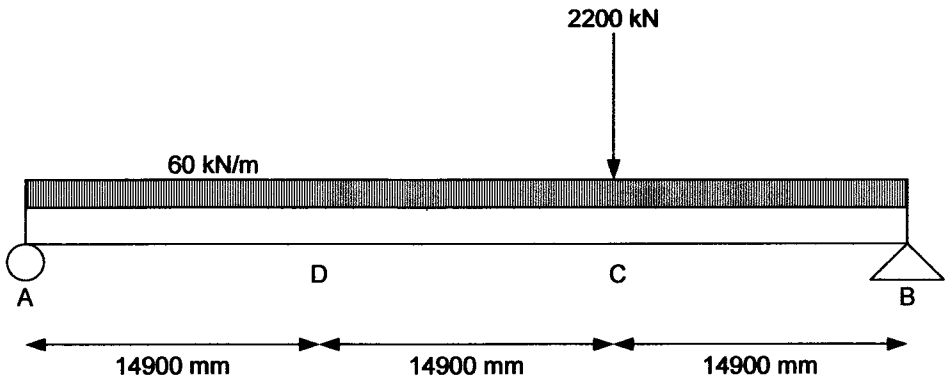
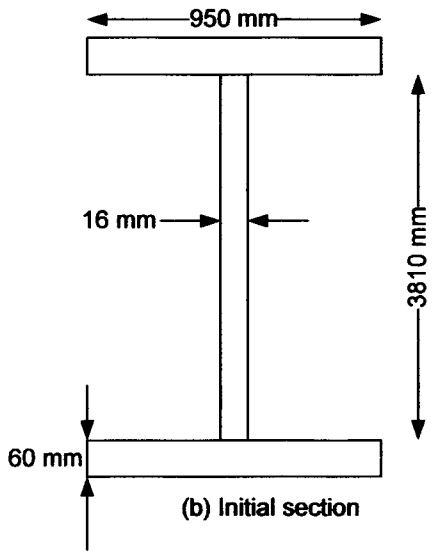
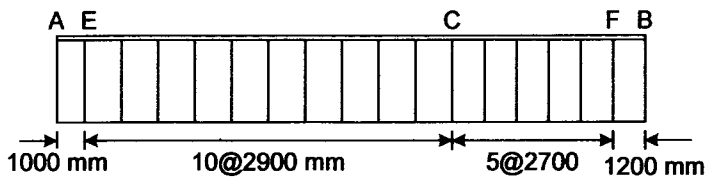


(a) Loading condition



(b) Initial section



(c) Stiffener spacing

FIGURE Q1

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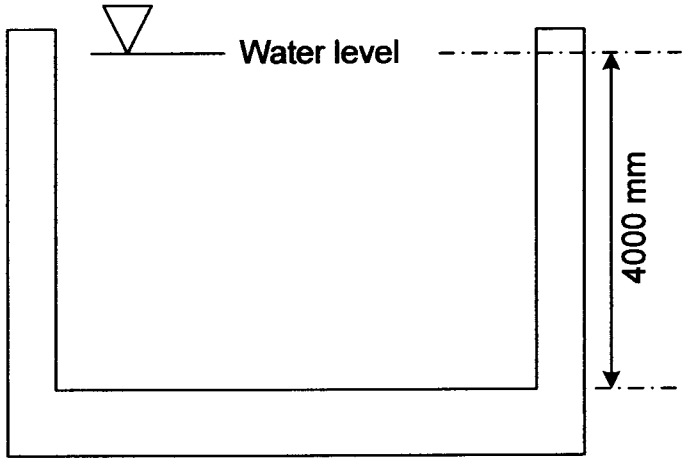

Table 3.2 Allowable ultimate shear force in slabs (kN/m). Grade 35 concrete

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

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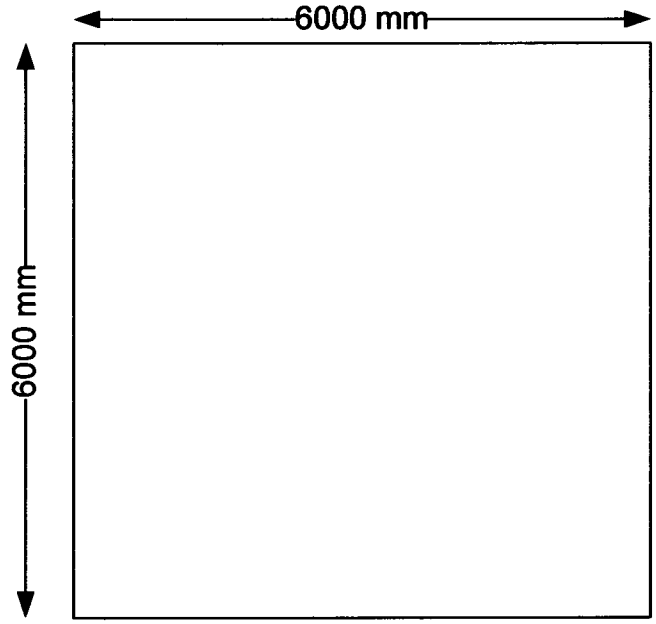

FIGURE Q3

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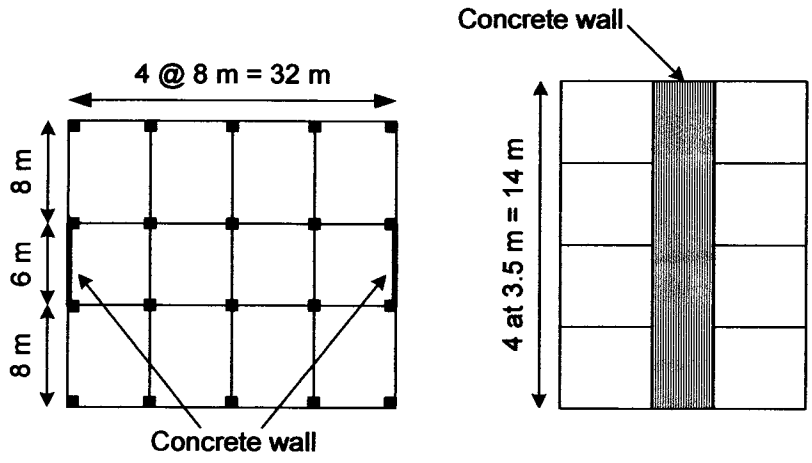
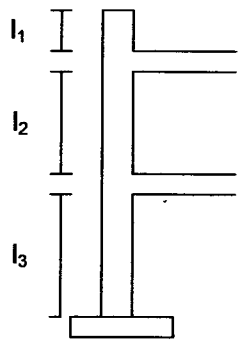
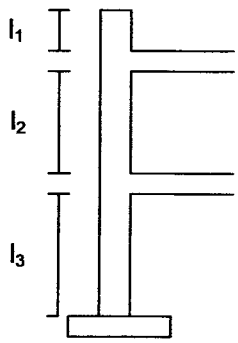


i) Plan view ii) Side elevation

(a)



(b) Support resist rotation and lateral movement



(c) Support resist lateral movement only

FIGURE Q4