UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2012/2013

COURSE NAME	:	ADVANCED STRUCTURE DESIGN
COURSE CODE	:	BFS 4093
PROGRAMME	:	4 BFF
EXAMINATION DATE	:	DECEMBER 2012/JANUARY 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **ELEVEN (11)** 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

(8 marks)

(ii) Check the moment capacity

(7 marks)

(b) Based on stiffener placement in Figure **Q1 (c)**, check stiffener at A as bearing stiffener.

Try stiffener 2 flats 450 mm x 40 mm grade S275

(10 marks)

Q2 Figure **Q2** shows the plan view and cross section of water reservoir. The plan size is 21 m x 32 m. The maximum water height is 6.5 m and the normal height of stored water is 6.0 m.

(a) By using a tables given in **Appendix 1**, estimate the wall thickness;

(2 marks)

(b) Calculate the area of reinforcement of the wall;

(6 marks)

(c) Check applied moment against ultimate moment of resistance.

(6 marks)

(d) Calculate the design crack width.

(11 marks)

Q3 (a) Sketch a flat slab without drop panel; with drop panel and flat slab with flared column head

(6 marks)

(b) Design a waffle slab for an internal panel of a floor system that is constructed on 8 m square module as in Figure **Q3**. The total dead load is 6.5 kN/m^2 and the imposed load is 2.5 kN/m^2. The materials of construction are grade 30 for concrete and grade 460 for reinforcement.

(19 marks)

Q4 (a) A composite floor in Figure **Q4** constructed on a beam at 3 m centers and 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 = 2.5 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) Check the beam deflection during construction

(8 marks)

(ii) Calculate the moment resistance of the beam

(9 marks)

(iii) Check for shear connector. (A_{sv} = 0.95, f_y = 460 N/mm^2)

(8 marks)

Q5 Figure **Q5** shows that gravity wall which will be cast into the foundation soil to a depth of 1.0 m. Take a unit weight of concrete as 24 kN/m^3, and ignore the passive resistance in front of the wall.

(a) Sketch the earth pressure diagram and surcharge pressure behind the wall.

(9 marks)

(b) Check wall stability against overturning.

(8 marks)

(c) Check wall stability against sliding.

(8 marks)

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

(i) Kelaskan keratan bagi bebibir dan web.

(8 markah)

(ii) Kirakan kapasiti momen bagi keratan ini.

(7 markah)

(b) Berdasarkan kedudukan pengukuh di dalam Rajah **S1 (c),** semak plat pengukuh di A sebagai pengukuh galas.

Cuba 2 pengukuh rata 450 mm x 40 mm gred S275

(10 markah)

S2 Rajah **S2** menunjukkan pandangan pelan dan keratan rentas takungan air. Saiz pelan ialah 21 m x 32 m. Ketinggian air maksimum adalah 6.5 m dan ketinggian air yang ditakung adalah 6.0 m.

(a) Dengan menggunakan jadual di dalam **Appendix 1**, kirakan ketebalan dinding

(2 markah)

(b) Tentukan bilangan tetulang keluli yang diperlukan oleh dinding.

(6 markah)

(c) Semak momen kenaan terhadap momen rintangan muktamat.

(6 markah)

(d) Kirakan rekabentuk lebar keretakan

(11 markah)

S3 (a) Dengan menggunakan lakaran , lukiskan papak rata tanpa panel jatuhan; dengan panel jatuhan dan papak rata dengan kepala tiang '*flared*'

(6 markah)

(b) Rekabentuk papak waffle bagi panel dalaman sistem penapak yang dibina di atas 8 m segiempat sama seperti di dalam Rajah **S3**. Jumlah beban mati adalah 6.5 kN/m^2 and beban kenaan adalah 2.5 kN/m^2. Bahan yang digunakan adalah gred 30 untuk konkrit dang red 460 untuk besi tetulang.

(19 markah)

S4 Papak rencam dengan jarak di antara rasuk adalah 3 m dan panjang rasuk adalah 12 m seperti di dalam Rajah **S4**. Ketebalan papak ialah 130 mm dan dikenakan daya kenaan 5 kN/m^2, beban sekatan = 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 S355:

(a) Semak pesongan rasuk semasa pembinaan.

(8 markah)

(b) Kirakan momen rintangan rasuk.

(9 markah)

(c) Semak stud ricih.(A_{sv} = 0.95, f_y = 460 N/mm^2).

(8 markah)

S5 Rajah **S5** menunjukkan tembok gravity yang dibina di dalam tanah asas dengan kedalaman 1.0 m. Dengan mengambil berat unit konkrit adalah 24 kN/m^3 dan mengabaikan rintangan pasif dihadapan tembok:

(a) Lukiskan gambarajah tekanan tanah dan tekanan pembebanan dibelakang tembok.

(8 markah)

(b) Semak kestabilan tembok terhadap keterbalikan.

(8 markah)

(c) Semak kestabilan tembok terhadap gelinciran.

(8 markah)

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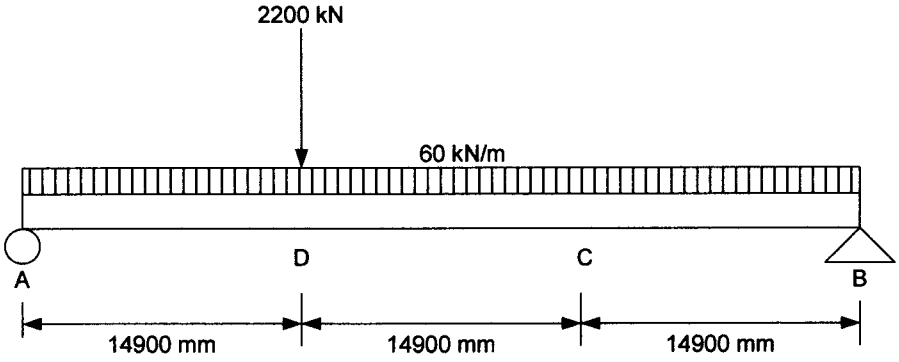
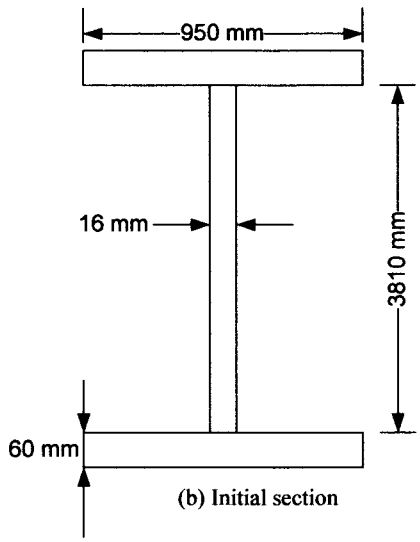
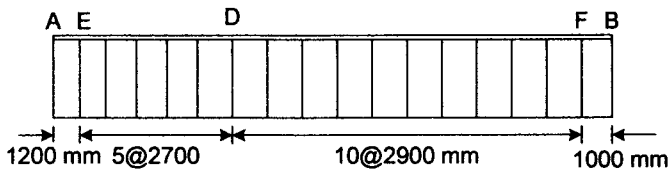


(a) Loading condition



(b) Initial section



(c) Stiffener spacing

FIGURE Q1/RAJAH S1

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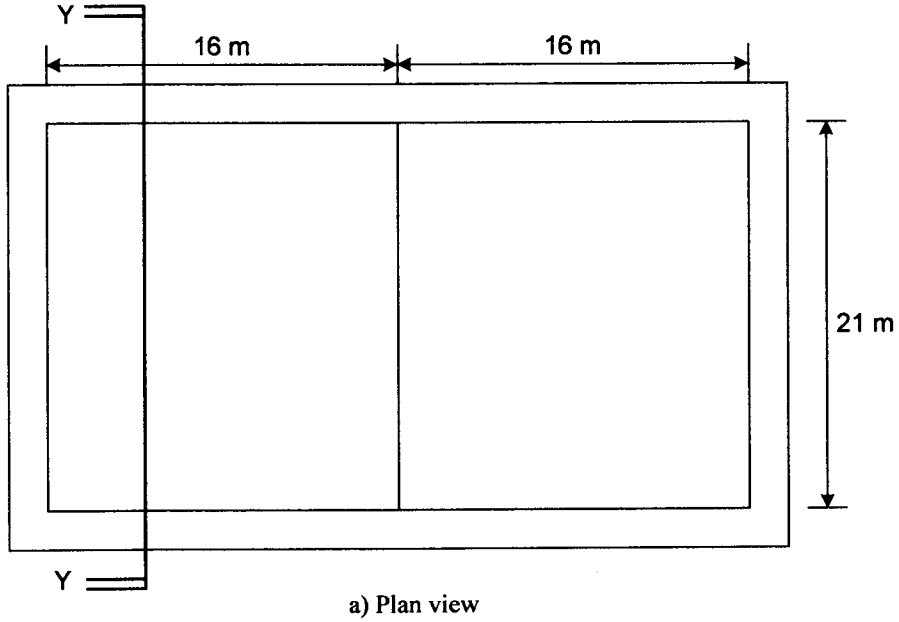
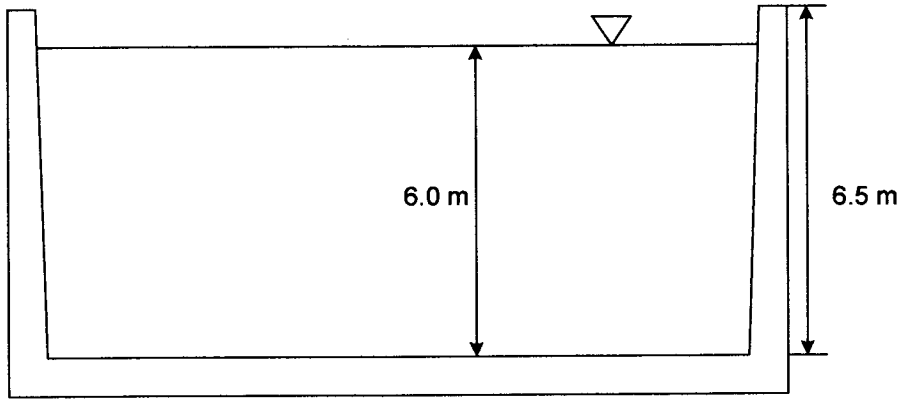


a) Plan view



b) Section Y-Y

FIGURE Q2/ RAJAH S2

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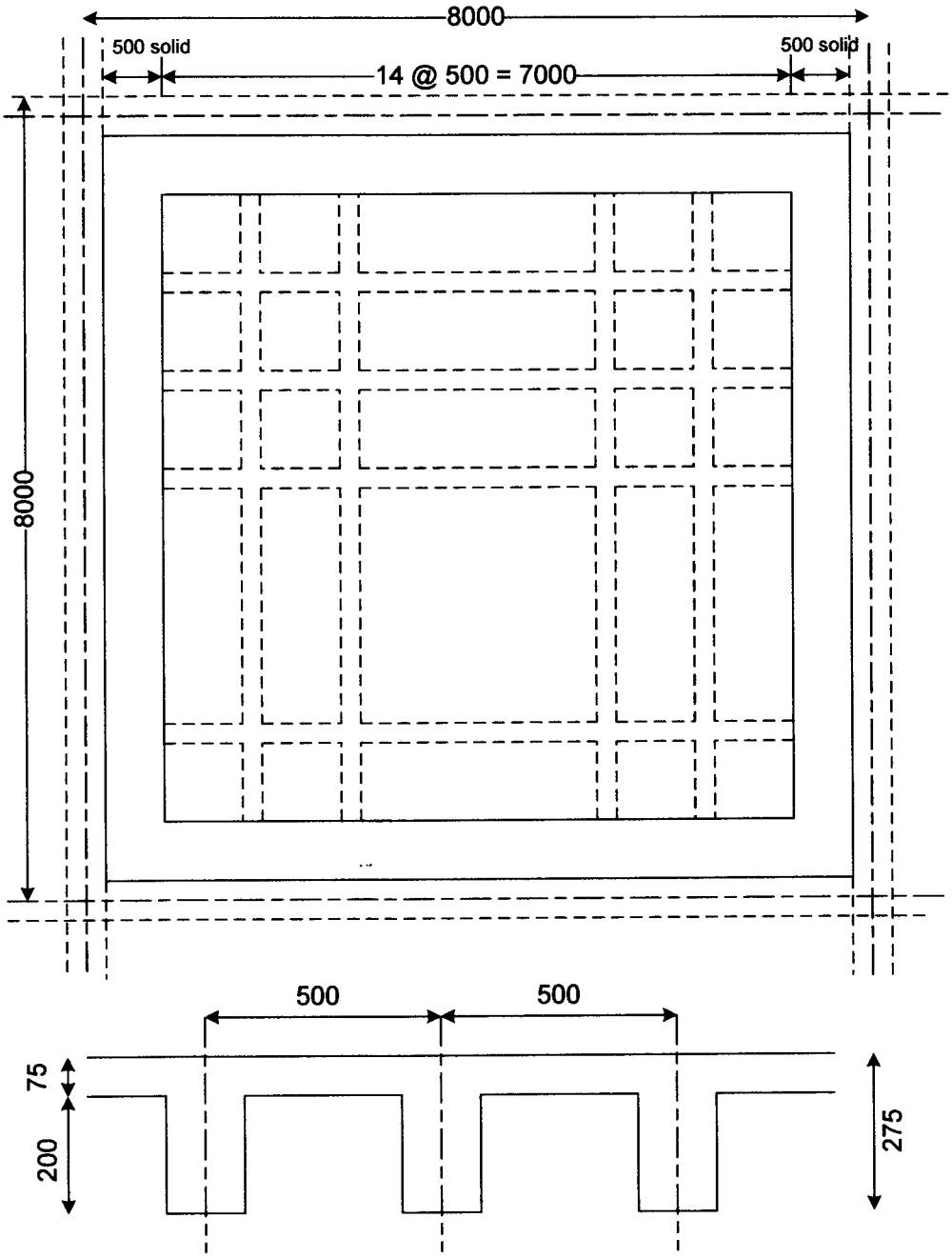

FIGURE Q3/RAJAH S3

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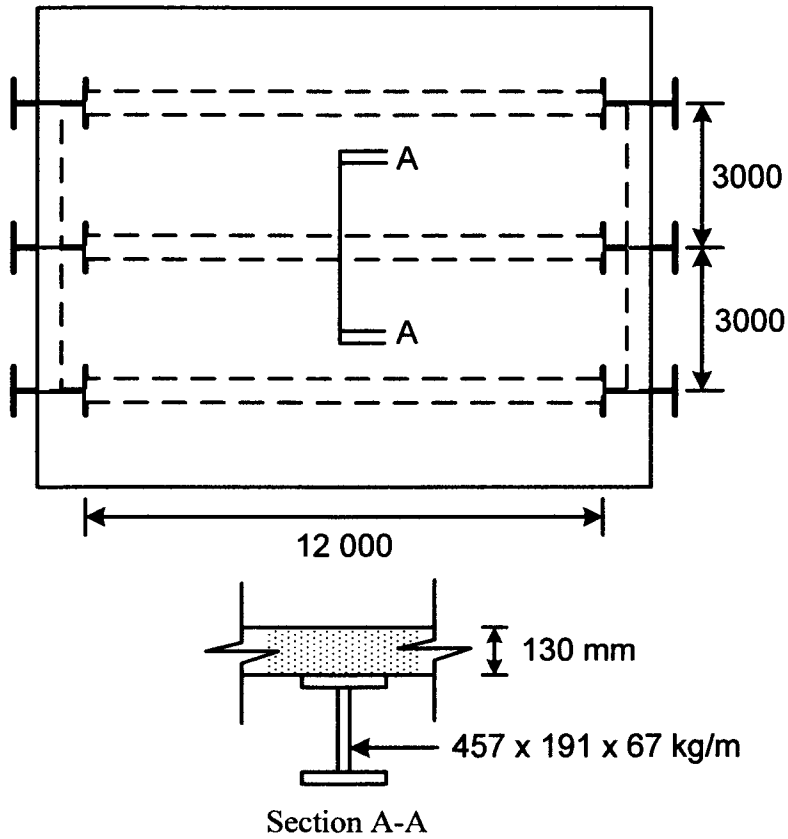

Section A-A

FIGURE Q4/RAJAH S4

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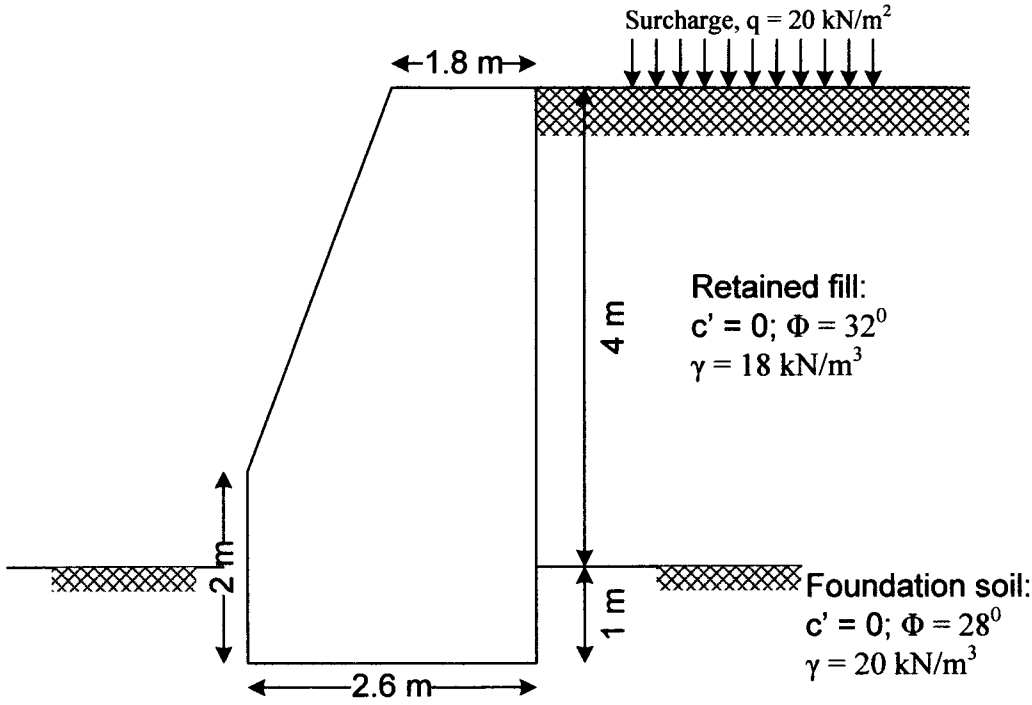

FIGURE Q5/ RAJAH S5

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APPENDIX 1:

Table 3.1 Approximate minimum thickness h (mm) of R. C. Cantilever wall subjected to water pressure

Height of wall (m)	Minimum wall thickness h (mm)
8	800
6	700
4	450
2	250

Table A2.12 $h = 800$ Cover to main bars = 56 Crack width = 0.2

Bar size (mm)	Bar spacing (mm)						
	100	125	150	175	200	250	300
12	*317.2* *285* *279*	*253.7* *285* *259*					
16	372.8 275 338	318.0 290 313	*374.9* *285* *295*	*321.3* *285* *280*	*281.2* *285* *268*		
20	484.1 233 391	399.7 238 363	344.6 245 342	306.7 253 325	279.8 262 310	*245.2* *285* *288*	*292.1* *285* *271*
25	654.7 207 453	526.8 206 420	442.5 206 396	384.0 207 376	342.1 209 359	287.7 218 334	255.3 231 314
32	945.4 189 532	746.8 184 494	614.2 180 465	521.3 176 442	454.0 174 422	365.7 174 392	312.4 177 369

$$w = \frac{3a_{cr}\,\epsilon_m}{1 + 2\left(\frac{a_{cr} - c_{min}}{h - x}\right)}$$

For limiting crack width of 0.2 mm:

$$\epsilon_2 = \frac{b_t(h - x)\,(a' - x)}{3E_s A_s (d - x)}$$

For limiting crack width of 0.1 mm:

$$\epsilon_2 = \frac{1.5b_t(h - x)\,(a' - x)}{3E_s A_s (d - x)}$$

$$\varepsilon_1 = \frac{(h-x)}{(d-x)} \times \frac{f_s}{E_s}$$