UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2016/2017

COURSE NAME	:	WATER SUPPLY ENGINEERING
COURSE CODE	:	BFA40203
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	DECEMBER 2016 / JANUARY 2017
DURATION	:	3 HOURS
INSTRUCTIONS	:	1. ANSWER **FOUR (4)** FROM FIVE (5) QUESTIONS
		2. WRITE DOWN YOUR ANSWERS IN THE ANSWER BOOKLET
		3. ATTACH ALL YOUR ANSWERS IN GRAPH PAPERS TO THE ANSWER BOOKLET

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THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 (a) Discuss briefly the roles of corporate sectors in overcoming non-revenue water issues.

(7 marks)

(b) Estimate the total water demand using **Table 1** and **Table 2** in year 2026 for the propose development areas consist of;

(i) 50 acres of industrial area, 100 units of terrace house and 20 units of commercial lot.

(9 marks)

(ii) 5 acres of hospital, hotel with 50 rooms, and 50 units of 2-storey bungalow lot.

(9 marks)

Given the population in year 2016 is 20,000 peoples.

Q2 (a) Explain the mechanism of flocculation process. (5 marks)

(b) A flocculation basin has following data:

Flocculation basin = 3 unit
Design flow rate = 15 m^3/min
Detention time = 30 min
Water depth = 4.2 m
Dynamic viscosity at 24°C = 0.000911 Pa.s
Efficiency of transfer of motor power to water power = 85%

Determine;

(i) Basin volume.

(5 marks)

(ii) Tank size.

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(5 marks)

(iii) Required input power.

(5 marks)

(iv) Impeller location.

(5 marks)

Q3 (a) Discuss the design of rapid sand filter and slow sand filter. (10 marks)

(b) Propose a suitable filter design for the following case:

Estimated design flow(s) : $25,000 \text{ m}^3/\text{day}$
Estimated filtration rate(s) : $280 \text{ m}^3/\text{day.m}^2$

State any assumption used.

(15 marks)

Q4 (a) Discuss a complete sedimentation process in the water treatment system. (10 marks)

(b) Propose the sedimentation basin's size which has the following conditions:

Average Flow(s) : $6000 \text{ m}^3/\text{d}$
Detention time : 2 hr
Basin depth, D : 4 m
Maximum weir loading : $250 \text{ m}^3/\text{d/m}$
Surface overflow rate : $20 \text{ m}^3/\text{d/m}^2$
Max. horizontal velocity : 2.5 mm/s

(15 marks)

Q5 (a) Discuss types of lay piping work in water distribution system. (10 marks)

(b) Design a suitable pipe size using **Table 1** and **Table 3** for the proposed development project consist of 5 hectare of medium industrial building.

(15 marks)

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– END OF QUESTIONS –

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PEPERIKSAAN AKHIR

SEMESTER/SESSION : SEM I / 2016/2017	KOD PROGRAM : 4 BFF
NAMA KURSUS : WATER SUPPLY ENGINEERING	COURSE CODE : BFA40203

TABLE 1

No.	TYPE OF PREMISES	Water Demand
1	Low Cost Terrace House /Flat	1135 lpd (250 gpd)
2	Single Storey Terrace / Low Medium & Medium Costs Flats	1360 lpd (300 gpd)
3	Double Storey Terrace House/High Cost Flats	1590 lpd (350 gpd)
4	Semi Detached House	1820 lpd (400 gpd)
5	Bungalow / Condominiums	2270 lpd (500gpd)
6	Shophouse (Single Storey)/ Gerai	2270 lpd (500gpd)
7	Shophouse (Double Storey)	2730 lpd (600 gpd)
8	Shophouse (Three Storey)	4090 lpd (900 gpd)
9	Light Industrial Workshop	1590 lpd (350 gpd)
10	Semi Detached / Bungalow Workshops	2730 lpd (600 gpd)
11	Heavy Industry	65,000 l/ha/day
12	Medium Industry	50,000 l/ha/day
13	Light Industry	33,000 l/ha/day
14	Office / Complex / Commercial (Domestic Usage)	1,200 lpd/100s.q.m
15	Hotels (with dining and laundry facility – Domestic Usage)	
	Hotel (3 star)	1360 lpd/room
	Hotel (5 star)	2000 lpd/room
16	Schools /Education Institutions	
	-Day School / Institution	55 lpd/student
	- Fully Residential	360 lpd/student
17	Hospitals (domestic usage)	1100 lpd/bed
18	Mosque (domestic usage)	135 lpd/person
19	Other place of worship	55 lpd/person
20	Wet Market	820 lpd/store
21	Petrol Kiosk	5000 lpd/service bay
22	Stadium	55 lpd/person
23	Golf Course	5500 lpd/hole

Notes:-

gpd	=	Gallon per day
lpd	=	Liter per day
l/ha/day	=	Liter/hectares/day

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TABLE 2

FIRE RISK

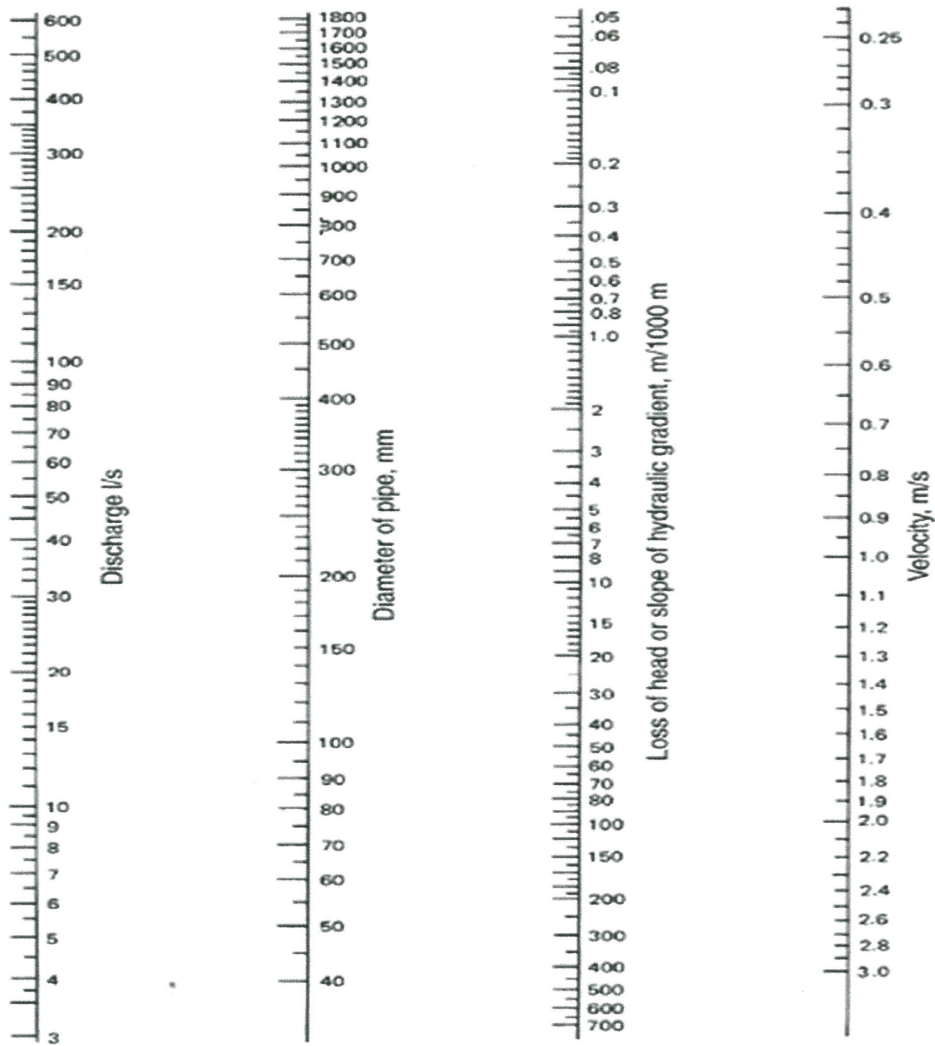|	Average Total Flow (Litres) (Per Minute)	Spanning (Meters)	Maximum No. Of. Hydrant Outlets Used Simultaneously
Class A Risk Large buildings, shopping complexes, high rise buildings, large industrial estate, warehouse and ports.	4100	90	3@ 1370 lpm
Class B Risk Congested areas with buildings up to 5 storeys.	2700	90	2 @ 1370 lpm
Class C Risk Shophouse up to 3 storey, light industry	1370	90	1
Class D Risk Residential terrace house, detached, semi detached	1140	120-terrace 150-detached / semi detached	1
Class E Risk Others	680	180	1

Notes:-   lpm   =   Litre per minute

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TABLE 3

C=100

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