UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2015/2016

COURSE NAME	:	WATER SUPPLY ENGINEERING
COURSE CODE	:	BFA 40203
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JUNE / JULY 2016
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FOUR (4)** QUESTIONS ONLY

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

Q1 (a) Sketch and label the processes of water supply system from water intake till storage tank.

(5 marks)

(b) Flow records of a river (Table 1) represent the lowest seven consecutive days average discharge from 1989 to 2010. The river supply is intended for abstraction to meet an average demand of 15 ft^3/s of a community.

Table 1: Average River Discharge For 22 years

Year	River Discharge, ft^3/s
1989	19.6
1990	28.6
1991	18.1
1992	34.3
1993	29.3
1994	35.7
1995	35.0
1996	27.0
1997	35.0
1998	36.9
1999	30.1
2000	50.6
2001	35.3
2002	59.4
2003	26.3
2004	90.3
2005	29.4
2006	29.7
2007	30.4
2008	49.6
2009	36.6
2010	59.1

(i) Tabulate the flows in order of severity using serial number M with values from 1 to n and the probability ranking using the formula M/(n+1).

(8 marks)

(ii) Plot the flows against their probability in the probability paper provided in **Figure 1**.

(8 marks)

(iii) Determine the minimum flow for a 10-year return period.

(4 marks)

Q2 (a) Explain the design criteria for a flocculation basin with a baffle wall.

(5 marks)

(b) Design a flocculation basin by determining the basin volume, tank dimensions, required input power, and impeller location using the following data:

Flocculation basin	= 2 unit
Design flow rate	= 12 m^3/min
Detention time	= 30 min
Water depth	= 4 m
Compartment	= 3
Velocity gradient, G in each compartment	= 70, 50 and 30 s^{-1}
Dynamic viscosity at 24°C	= 0.000911 Pa.s
Efficiency of transfer of motor power to water power	= 80%
Impeller placement at one-third of water depth	

(20 marks)

Q3 (a) Discuss the design requirements for direct filtration to treat raw river water with low turbidity and colour.

(10 marks)

(b) Design a rapid sand filter by determining the area, length, and width of each filter using the following data:

Design flows	= 20,000 m^3/day
Filtration rate	= 250 m^3/day.m^2
Number of filter	= 4 unit
Area increment for each filter	= 1/3
Width (W) of filter with two (2) cells	= 5 m
Length-width ratio	= 3:1

(15 marks)

Q4 (a) Sketch the movement of water and solids in a rectangular sedimentation tank for water treatment system.

(5 marks)

(b) Two similar rectangular sedimentation basins receive an average flow of 6720 m^3/d. Determine the length (L) and width (W) of one basin to satisfy the following conditions at the average flow conditions:

Detention time = 4 hrs
Basin depth D = 3 m
Maximum weir loading = 250 $m^3/d/m$
Surface overflow rate = 25 $m^3/d/m^2$
Maximum horizontal velocity = 2.5 mm/s

(20 marks)

Q5 The following are some of the recorded design data:
Population = 200,000 people
Domestic demand=320 LPCD
Other water demands = 57% of domestic demand
Fire fighting = 350 m^3/h for 10h duration
Effective lift for low lift pumping = 20m
Effective lift for high lift pumping = 60m
Pumping of treated water = 8h daily
Length of pipe from intake to WTP = 1000m
Length of pipe from WTP to an uphill reservoir = 1500m

Based on the above data, determine the followings; (State any assumptions used).

(i) The size of the pipe from the intake to the WTP

(5 marks)

(ii) The size of the trunk mains from the WTP to the uphill reservoir

(5 marks)

(iii) The amount of water required for fire fighting

(5 marks)

(iv) The total amount of storage for the community

(5 marks)

(v) The power of the low lift pump at 65% efficiency

(5 marks)

-END OF QUESTIONS-

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FIGURE 1 : LOGARITHMIC PROBABILITY PAPER