Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2013/2014

COURSE NAME	:	WATER RESOURCES ENGINEERING
COURSE CODE	:	BFW 4013 / BFW 40103
PROGRAMME	:	4 BFF
EXAMINATION DATE	:	DECEMBER 2013/JANUARY 2014
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **NINE (9)** PAGES

Q1 (a) Identify **THREE (3)** purposes of water resources development.

(3 marks)

(b) Explain **THREE (3)** main issues or problems related to water resources management in Malaysia

(6 marks)

(c) Explain the typical variation of water usage in a day for Malaysian by using appropriate graph

(5 marks)

(d) Suggest **THREE (3)** ways in reducing water uses.

(6 marks)

Q2 (a) State **TWO (2)** direct and **TWO (2)** indirect measurements for streamflow measurement

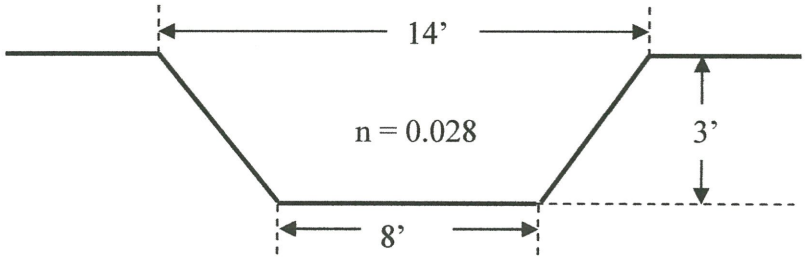
(4 marks)

(b) Explain briefly **THREE (3)** purposes of streamflow measurement

(6 marks)

(c) Compute the peak run-off, Q_p, for a 20-year storm using Rational Method for a drainage basin of 20 acres and having the following parameters:
Time of concentration:

- Overland: poor grass surface, length 350ft and slope 2.5%,
- Shallow concentrated flow: length 450ft and slope 3.8%,
- Stream: length 1200ft, slope 0.6% and average cross section of:



Runoff coefficient:
Impervious 2.5 acres @ c = 0.88,
Grass, 10.3 acres @ c = 0.32,
Wooded, 7.2 acres @ c = 0.26.
Also given P = 1.4 inches

(10 marks)

Q3 (a) Explain briefly **FOUR (4)** benefits of MSMA application. Provide a suitable chart or graph to support your answer

(8 marks)

(b) Explain the difference between on-line and off-line system for on-site detention pond (OSD)

(4 marks)

(c) Based on your understanding, suggest **FOUR (4)** benefits of rainwater harvesting

(8 marks)

Q4 (a) Parit Raja catchment is expected to be hit by flood in the year 2015. As an engineer, Provide a best management practices that can be applied to reduce the flood magnitude, lost in property as well as life.

(12 marks)

(b) With referred to Table **Q4,** construct intensity-duration-frequency (IDF) curves for 20-year and 10-year frequencies for Parit Raja town.

(8 marks)

Q5 (a) Discuss **THREE (3)** differences between dam and spillways

(6 marks)

(b) Based on your understanding about the function of dams, spillways and information on soil foundation, Explain briefly **THREE (3)** causes of dam failure.

(6 marks)

(c) A reservoir covers an area of 650 km^2 and has an average depth of 14.3 m. The inflow to the reservoir is from a river with an average flowrate of 1900 m^3/s and a suspended sediment concentration of 230 mg/L. Estimate sediment volume accumulation rate and rate of sediment accumulation. Assume that the accumulated sediment has a bulk density of 1600 kg/m^3.

(8 marks)

Q6 (a) Mismanagement of irrigation system could lead to several problems. Explain in details **FOUR (4)** problems related to the irrigation system

(8 marks)

(b) Predict the 3-hour unit hydrograph using the following data in **Table Q6 (b)** for a watershed having a drainage area A, of 180 km^2, assuming a constant rainfall loss rate and a constant base flow of 25 m^3/s. Construct the hydrograph and the separation graph.

(12 marks)

- END OF QUESTIONS -

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2013/2014 PROGRAMME : 4 BFF
COURSE NAME : WATER RESOURCES ENGINEERING COURSE CODE : BFW 4013 / BFW 40103

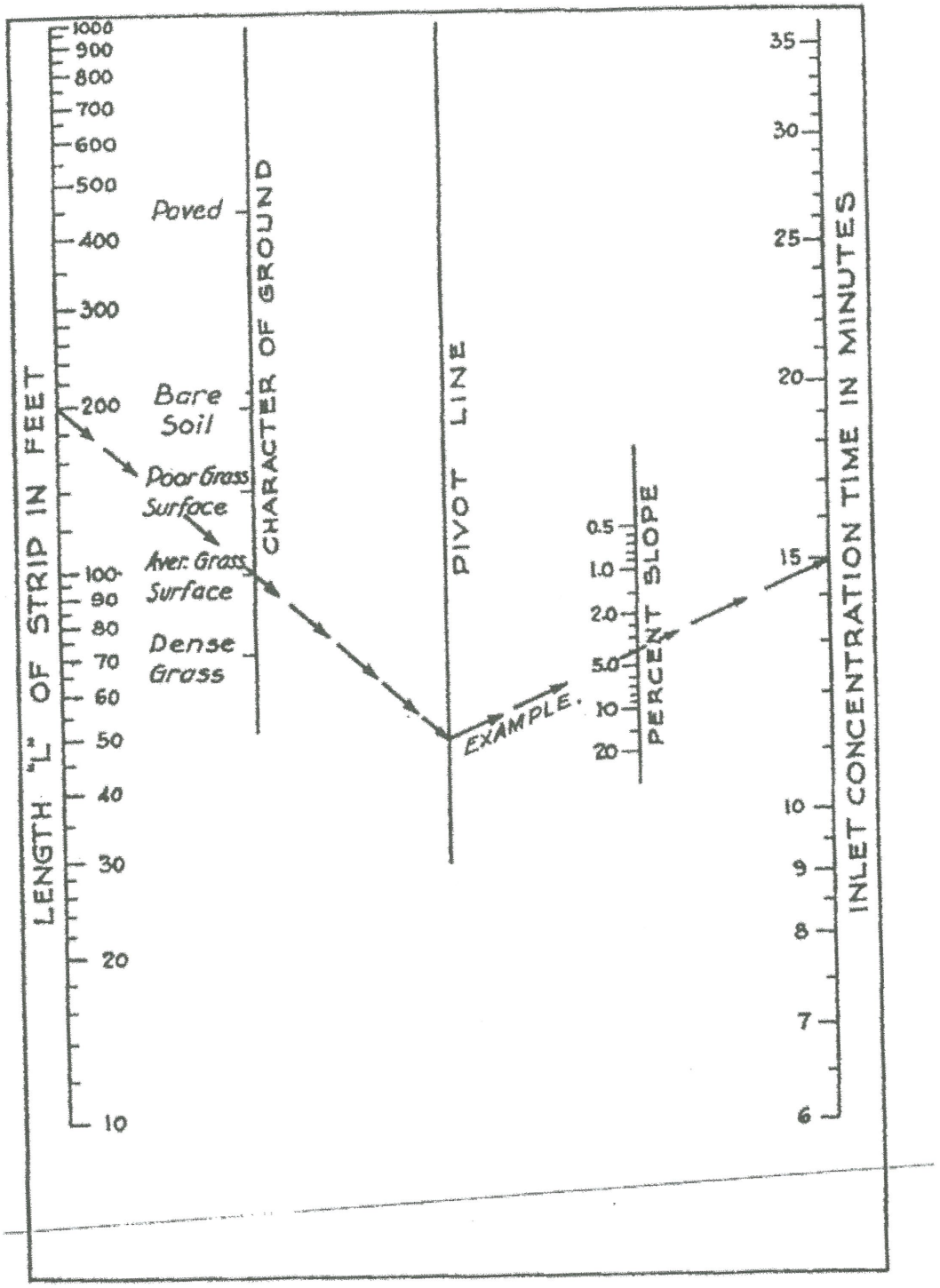


FIGURE Q2 (c) (ii) Nomograph for overland flow time

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2013/2014 PROGRAMME : 4 BFF
COURSE NAME : WATER RESOURCES ENGINEERING COURSE CODE : BFW 4013 / BFW 40103

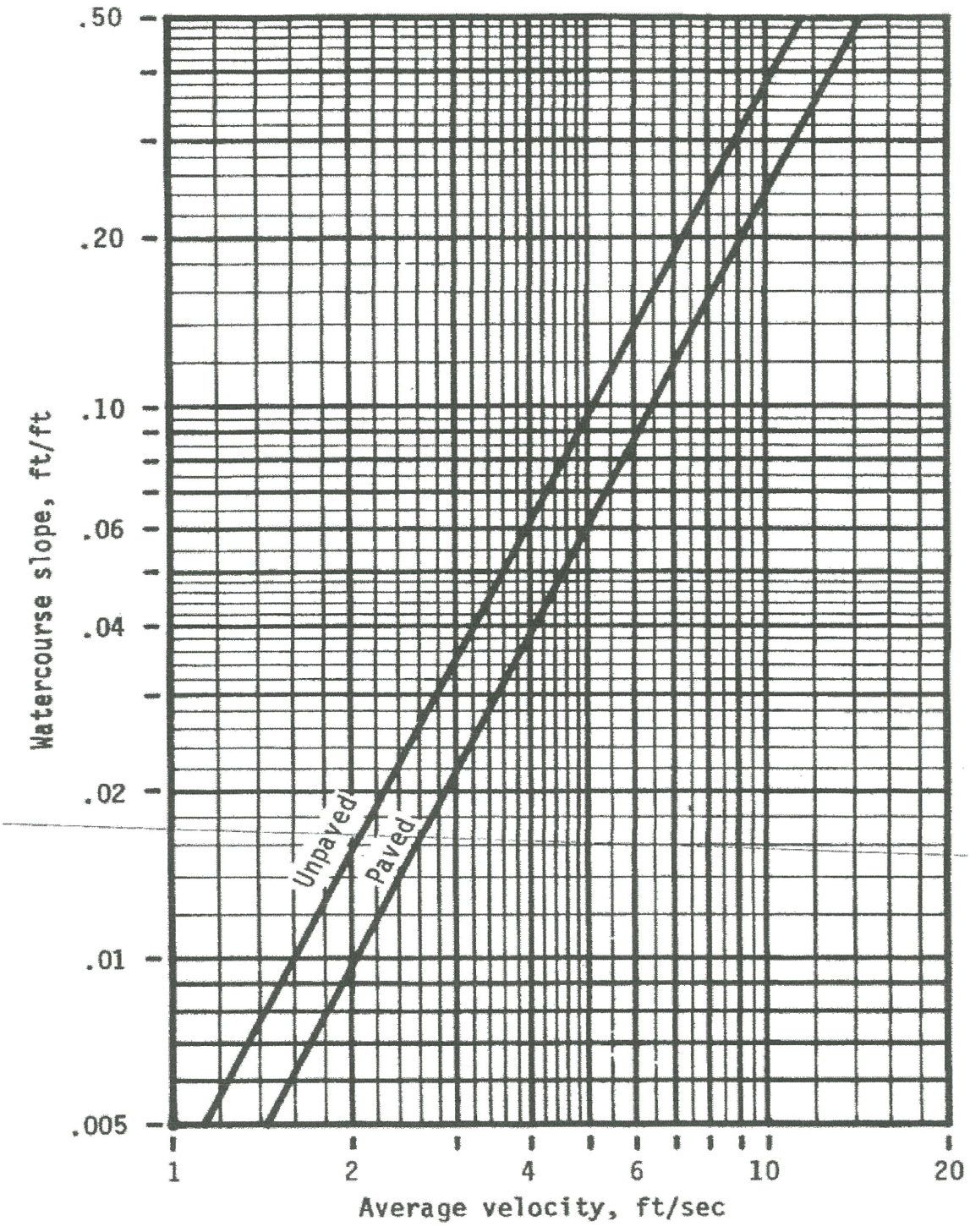


FIGURE Q2 (c) (iii) Average velocities for estimating travel time for shallow concentrated flow

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2013/2014 PROGRAMME : 4 BFF
COURSE NAME : WATER RESOURCES ENGINEERING COURSE CODE : BFW 4013 / BFW 40103

Intensity-Duration-Frequency (I-D-F) Curves

Example: For a selected 10-year return period, P_1 = 2.0 inches. T_C is calculated : 20 minutes. Therefore, (i) = 4.25 in/hr.

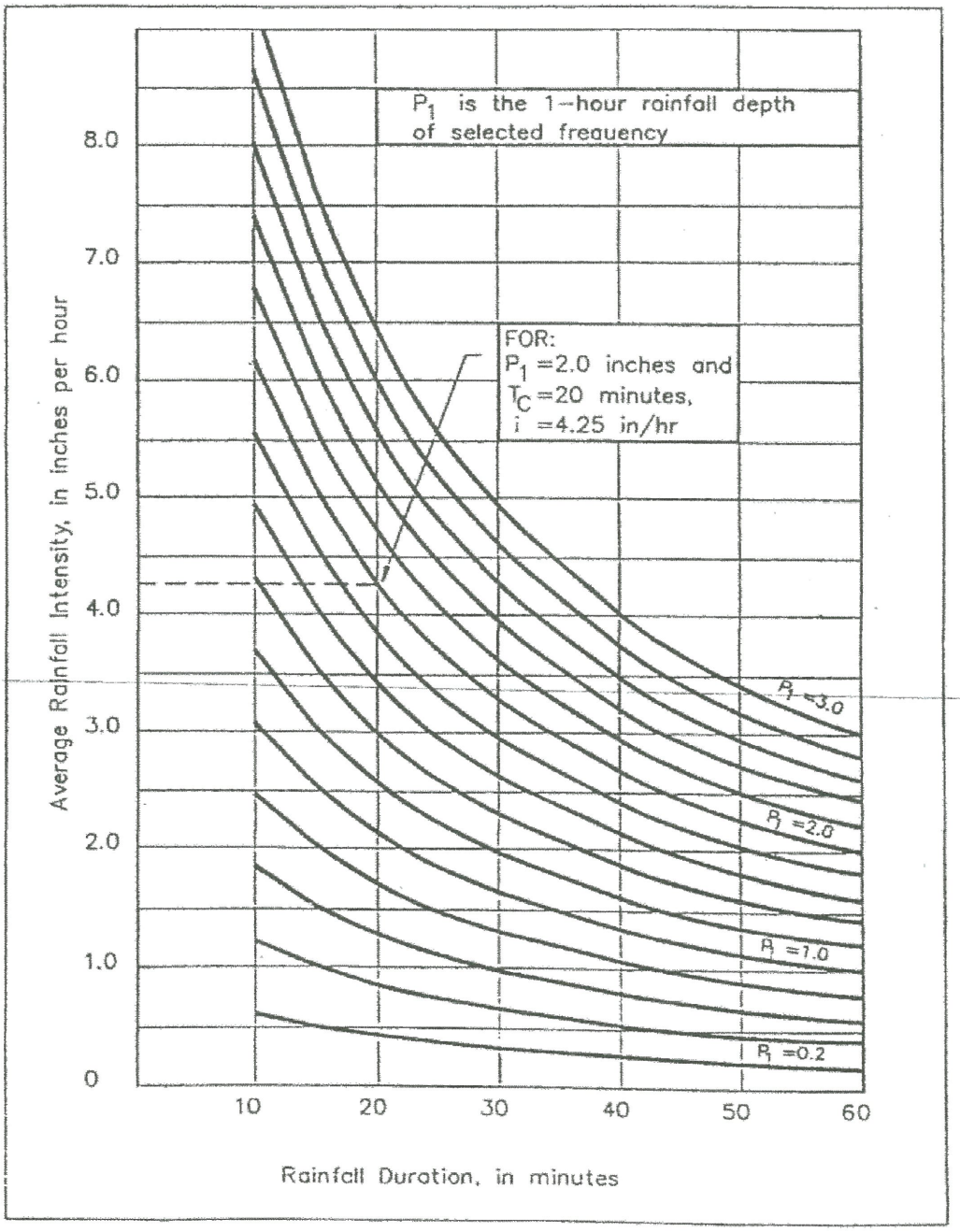


FIGURE Q2 (c) (iv) IDF curves

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2013/2014 PROGRAMME : 4 BFF
COURSE NAME : WATER RESOURCES ENGINEERING COURSE CODE : BFW 4013 / BFW 40103

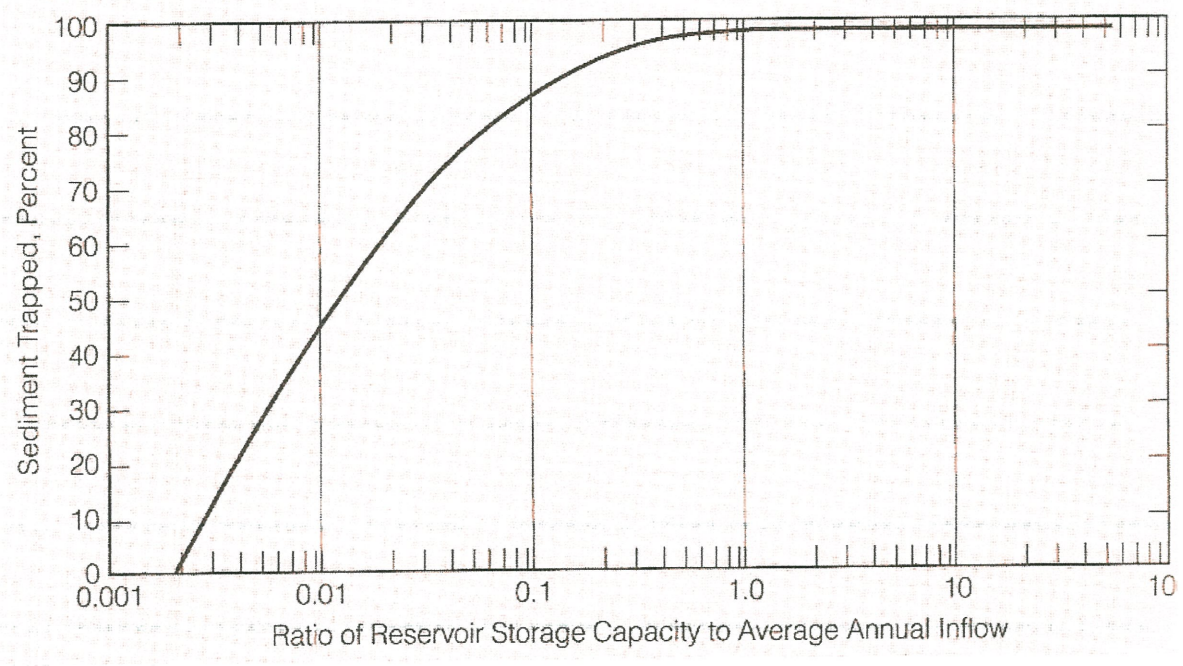


FIGURE Q5 (c)

TABLE Q4 Precipitation Data for Parit Raja Town

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rank	Precipitation (in) of Duration of:						Return
m	5 min	10 min	15 min	20 min	30 min	60 min	Period
1	0.46	0.68	0.89	1.07	1.48	2.15	
2	0.43	0.65	0.83	0.97	1.29	1.92	
3	0.40	0.63	0.79	0.91	1.26	1.48	
4	0.38	0.61	0.76	0.86	1.06	0.91	
5	0.36	0.60	0.73	0.86	0.83	0.87	
6	0.34	0.59	0.72	0.77	0.82	0.82	
7	0.32	0.55	0.72	0.77	0.78	0.78	
8	0.30	0.52	0.63	0.70	0.78	.	
9	0.29	0.49	0.57	0.67	0.67	.	
10	0.27	0.44	0.56	0.62	0.66	.	
.	.	.	.	.	.	.	
.	.	.	.	.	.	.	
22	0.12	0.22	0.32	0.39	0.38	0.41	

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2013/2014 PROGRAMME : 4 BFF
COURSE NAME : WATER RESOURCES ENGINEERING COURSE CODE : BFW 4013 / BFW 40103

TABLE Q6 (b)

Time (hour)	Flow (m^3/s)
0	25
3	25
6	25
9	32
12	39
15	50
18	80
21	170
24	270
27	220
30	195
33	154
36	96
39	55
42	34
45	26
48	25

EQUATIONS

$$t = \frac{d}{v} \qquad Q_p = CIA \qquad Q_p = CC_sIA \qquad t_c = 1.24\left(\frac{L}{S}\right)^{0.36} \qquad C_s = \frac{2t_c}{2t_c + t_d}$$

$$sediment\ volume = \frac{rate\ sediment\ accumulate}{bulk\ density} \qquad Ratio\ of\ storage = \frac{strorage\ capacity}{annual\ inflow}$$