
UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2006/2007

April 2007

**RLD 512– Hidrologi dan Kawasan Tadahan
(Hydrology and Watershed)**

Masa: 3 jam
(Duration : 3 hours)

Sila pastikan bahawa kertas peperiksaan ini mengandungi **EMPAT** muka surat yang tercetak dan **DUA** Lampiran sebelum anda memulakan peperiksaan ini.

*Please check that this examination paper consists of **FOUR** pages of printed material and **TWO** Appendices before you begin the examination.*

Jawab **SEMUA** soalan.

*Answer **ALL** questions.*

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1. Manual Saliran Mesra Alam (MASMA) yang baru diperkenalkan menekankan konsep storan berbanding dengan konsep luahan segera (rapid discharge) yang digunakan dalam manual terdahulu. Jelaskan bagaimana komponen kerja lanskap di suatu kawasan pembangunan dapat membantu memenuhi objektif manual tersebut. Sila gunakan contoh dan lakaran yang sesuai untuk menyokong pendapat anda.

The newly introduced Manual Saliran Mesra Alam (MASMA) adopted the storage oriented approach as opposed to conveyance or rapid discharge by the previous manual. Describe how landscape works could contribute to the objectives of the new manual. Please provide examples and illustrations.

(20 markah/marks)

2. (a) Apakah itu "Gross Pollutant Trap"? Terangkan bagaimana struktur ini beroperasi.
 - (b) Guna **Jadual 1** bagi menentukan intensiti hujan jangka pendek untuk rekabentuk sistem minor (ARI = 2), seterusnya plotkan lengkung intensity - jangkamasa tersebut.
- (a) *What is Gross Pollutant Trap? Explain how this structure operates.*
- (b) *Use **Table 1** to calculate rainfall intensities for short term duration (<30 min) for use in designing minor systems (ARI = 2) and plot its's intensity-duration curve.*

Jadual 1(Table 1) : Coefficient of Polynomial Equation – Alor Star

State	Location	Date Period	ARI (Year)	Coefficients of the IDF Polynomial Equation			
				a	b	c	d
KEDAH	Alor Setar	1951-1983	2	5.6790	-0.0276	-0.0993	0.0033
			5	4.9709	0.5460	-0.2176	0.0113
			10	5.6422	0.1575	-0.1329	0.0056
			20	5.8203	0.1093	-0.1329	0.0053
			50	5.7420	0.2273	-0.1481	0.0068
			100	6.3202	-0.0778	-0.0849	0.0026

Diberi (Given):-

$$\ln (R_i) = a + b \ln (t) + c [\ln (t)]^2 + d [\ln (t)]^3$$

di mana (where):-

R_i = intensity (mm/hr) for ARI (R) and t duration

R = Average Recurrence Interval

t = duration (minutes)

(20 markah/marks)

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3. Kira kadar aliran puncak bagi kawasan yang merangkumi 2.35ha padang ragut jenis tanah lom berpasir dengan cerun 7%, 0.9ha kawasan letak kenderaan yang diturap dengan asphalt, dan 0.32ha keluasan berbumbung. Lokasi kawasan ini terletak di Bagan Serai dengan keamatan curahan hujan sebanyak 140mm/h mengikut keluk edaran hujan 10 tahun.

Calculate the peak runoff rate of an area comprising 2.35ha of pasture growing on sandy loam soil with 7% slope, 0.9ha of parking bay covered with asphalt, and 0.32ha of roof surface. The location is in Bagan Serai with rainfall intensity 140mm/h based on 10 years storm cycle.

(10 markah/marks)

4. Kira isipadu air larian permukaan untuk 15 minit jangkamasa hujan, 30 minit jangkamasa hujan, dan 50 minit jangkamasa hujan bagi kawasan hutan berbukit seluas 23 ekar dengan keadan tanah lom berpasir berdasarkan keluk edaran hujan 50 tahun. Masa konsentrasi kawasan tersebut adalah 30 minit.

Calculate the volume of runoff for a storm at 15 minute duration, 30 minute duration and 50 minute duration of a 23 acre hilly woodland area with sandy loam soil based on 50 year storm frequency. The time of concentration for the area is 30 minutes.

(20 markah/marks)

5. Kira kadar aliran air dan tekanan yang perlu dilakukan oleh pam?

Calculate the water flow rate the pump need to deliver and its pressure required?

Design spesifications:-

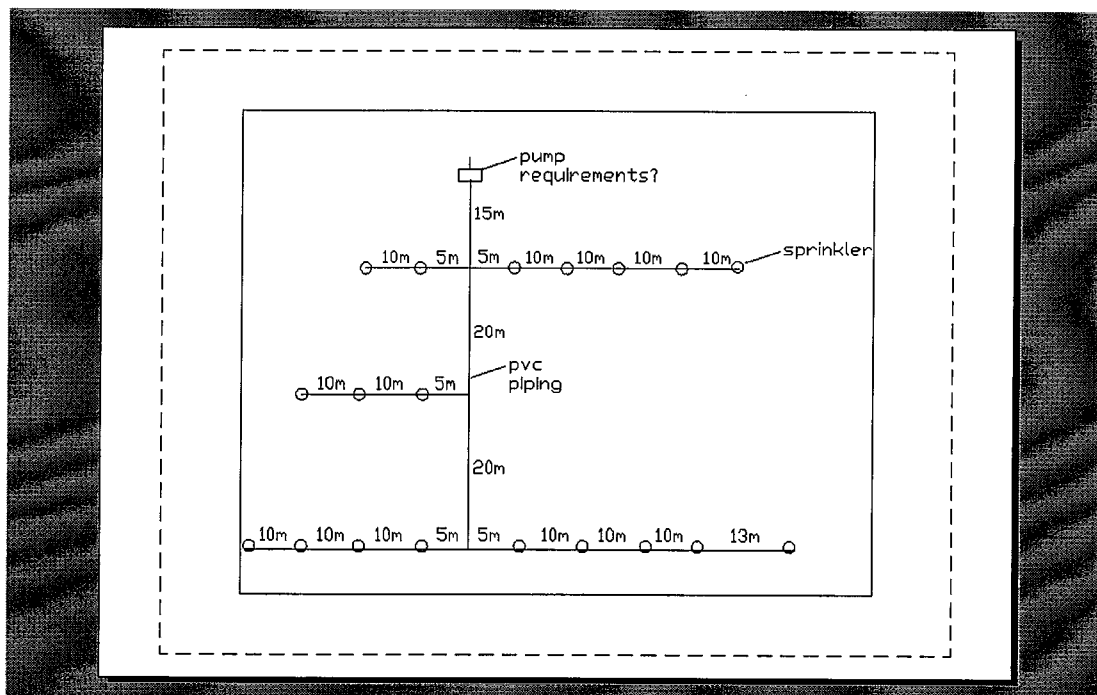
The pump is pumping up water from a well with the water level 5 meter below the pump.

19 nos. rotor pop-up sprinkler which require 0.30 l/s water flow, and 1.9 bar pressure each to operate.

All piping used Class 200 PVC, distance is in meter.

Assume pressure loss through all fittings are 10% of the piping pressure loss.

(20 markah/marks)



6. Bincangkan kepentingan pengairan renjis di padang golf dan di tapak semaian.

Discuss the importance of sprinkler irrigation in golf courses and nursery.

(10 markah/marks)

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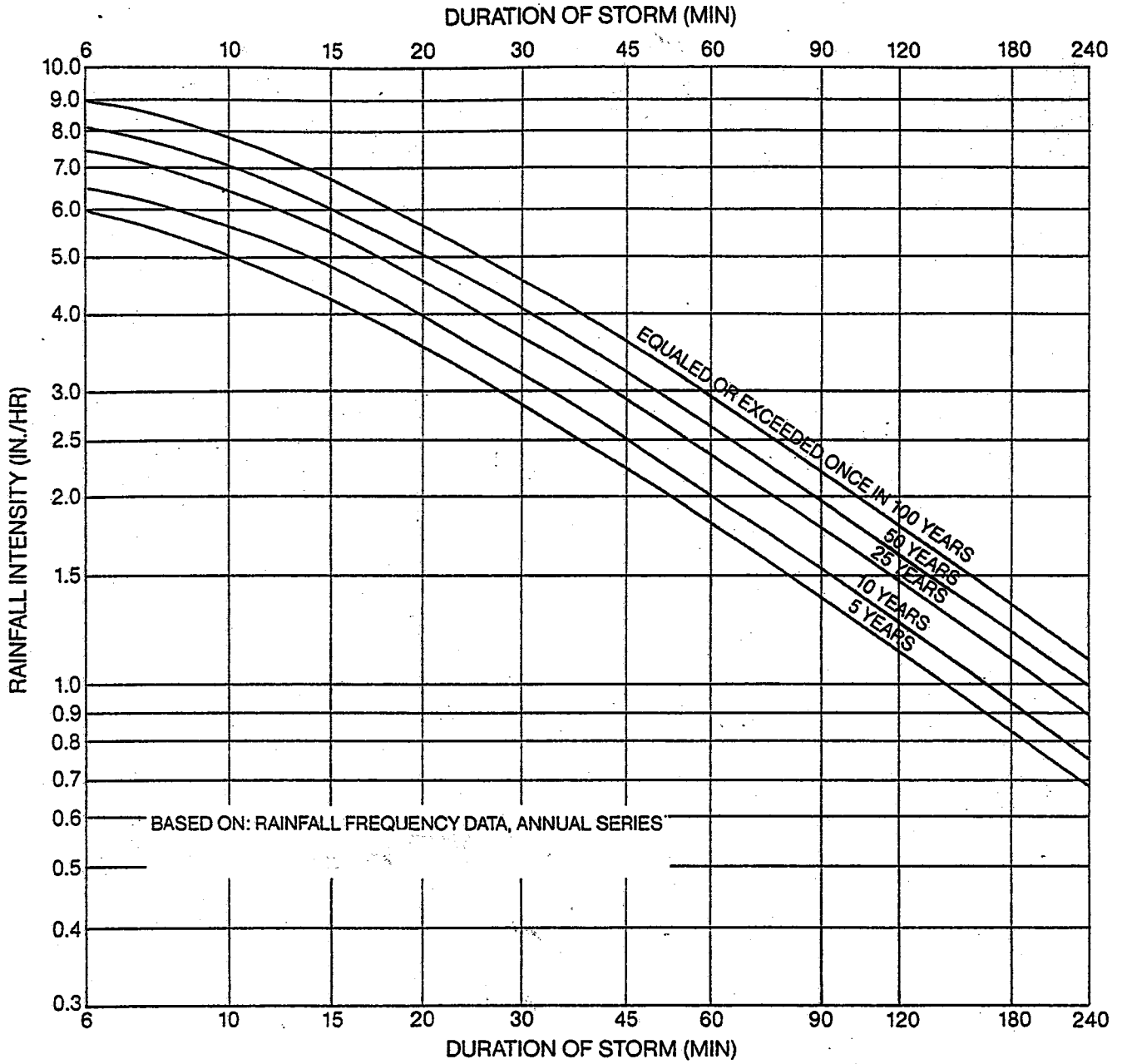


Figure 9.2. Rainfall intensity curves

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Table 9.1. Recommended Runoff Coefficients (C)

Urban areas ^a	
Downtown Business	0.70-0.95
Neighborhood Business	0.50-0.70
Single-family Residential	0.30-0.50
Detached Multi-Unit Residential	0.40-0.60
Attached Multi-Unit Residential	0.60-0.75
Suburban Residential	0.25-0.40
Apartment	0.50-0.70
Light Industry	0.50-0.80
Heavy Industry	0.60-0.90
Parks, Cemeteries	0.10-0.25
Playgrounds	0.20-0.35
Railroad Yards	0.20-0.35
Unimproved	0.10-0.30
Urban surfaces	
Roofs	0.80-0.95
Asphalt and Concrete Pavements	0.75-0.95
Gravel	0.35-0.70

Rural and suburban areas ^b	Soil Texture		
	Sandy loam	Clay and silt loam	Clay
Woodland			
flat (0-5% slope)	0.10	0.30	0.40
rolling (5-10% slope)	0.25	0.35	0.50
hilly (10-30% slope)	0.30	0.50	0.60
Pasture and Lawns			
flat	0.10	0.30	0.40
rolling	0.16	0.36	0.55
hilly	0.22	0.42	0.60
Cultivated or No Plant Cover			
flat	0.30	0.50	0.60
rolling	0.40	0.60	0.70
hilly	0.52	0.72	0.82

^aFrom American Iron and Steel Institute (1980)

^bFrom Schwab *et al.* (1971)

Table 9.2. Recommended Antecedent Precipitation Factors

Frequency	C _A
2 to 10	1.0
25	1.1
50	1.2
100	1.25

^aFrom American Public Works Association (1974)