SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI JUN 2019

DCC6213 : HYDRAULICS AND HYDROLOGY

TARIKH : 03 NOVEMBER 2019
MASA : 2.30PETANG-4.30PETANG (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.
Bahagian A : Struktur (2 soalan)
Bahagian B : Struktur (4 soalan)

Dokumen sokongan yang disertakan : Kertas Graf, Formula,
Manual Saliran Mesra Alam,
Borang Kadar Alir

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A : 50 MARKS
BAHAGIAN A : 50 MARKAH

INSTRUCTION:
This section consists of **TWO (2)** structured questions. Answer **ALL** questions.

ARAHAN:
*Bahagian ini mengandungi **DUA (2)** soalan berstruktur. Jawab **SEMUA** soalan.*

CLO1
C1

QUESTION 1
SOALAN 1

(a) Define the terms Hydraulic and Hydrology.

Takrifkan istilah bagi Hidraulik dan Hidrologi.

[5 marks]
[*5 markah*]

CLO1
C2

(b) A rectangular channel with the width of 9.14m flows water at the rate of 7.64m^3/s. The water flows at the depth of 914mm. Calculate the specific energy.

Satu saluran segiempat mempunyai lebar 9.14m mengalirkan air pada kadar 7.64m^3/s. Kedalaman aliran adalah 914mm. Kira tenaga tentu.

[5 marks]
[*5 markah*]

(c)

CLO1
C3

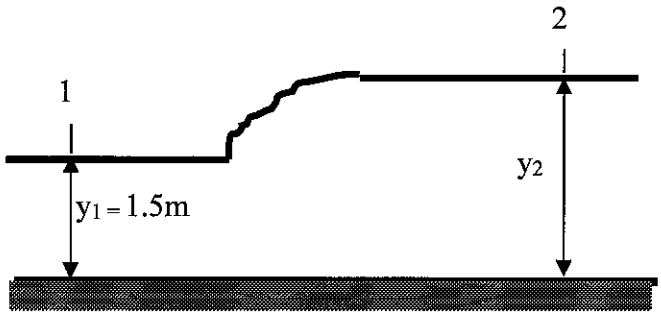


Figure A1 / *Rajah A1*

Water flows in a wide channel at the rate of $15m^3/s$. The upstream water depth is 1.5m. If hydraulic jump occurs, calculate:

Air mengalir dalam satu saluran lebar pada kadar $15m^3/s$. Kedalaman air di hulu ialah 1.5m. Jika lompatan hidraulik berlaku, kira:

i. Downstream depth

Kedalaman di bahagian hilir

[6 marks]
[*6 markah*]

ii. Velocity at downstream

Halaju di hilir

[3 marks]
[*3 markah*]

iii. Froude number at downstream

Nombor Froude di hilir

[3 marks]
[*3 markah*]

iv. Energy lost due to hydraulic jump

Kehilangan tenaga akibat lompatan

[3 marks]
[*3 markah*]

QUESTION 2
SOALAN 2

A pump is used to pump water as high as 14m. The pipe used is 400mm in diameter and its total length is 2500m. Friction coefficient of the pipe is 0.0025 and the pump works at the speed of 700 r.p.m. The characteristic of the pump is as follows:

Satu pam digunakan untuk mengepam air pada ketinggian 14m. Paip yang digunakan mempunyai diameter 400mm dan panjang 2500m. Pekali geseran paip ialah 0.0025 dan pam beroperasi pada kelajuan 700 r.p.m. Ciri-ciri pam adalah seperti berikut:

Table A2 / *Jadual A2*

Flowrate, Q (l/s) *Kadaralir, Q (l/s)*	*0*	*100*	*200*	*300*	*350*	*400*	*500*
Head, H (m) *Turus Tekanan, H (m)*	*15*	*17*	*18*	*16*	*14*	*11*	*5*
Efficiency, η (%) *Kecekapan, η (%)*	*0*	*30*	*60*	*81*	*83*	*80*	*45*

CLO1
C2

(a) Interpret pump characteristic and system characteristic in a graph.
Tafsirkan ciri-ciri pam dan ciri-ciri sistem dalam bentuk graf.

[13 marks]
[*13 markah*]

CLO1
C3

(b) Calculate the input and output power at that operational point.
Kirakan kuasa masukan dan keluaran kuasa pada titik operasi tersebut.

[12 marks]
[*12 markah*]

SECTION B : 100 MARKS

BAHAGIAN B : 100 MARKAH

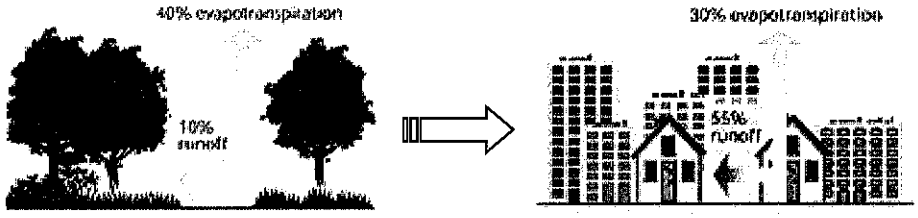
INSTRUCTION:
This section consists of **FOUR (4)** structured questions. Answer **TWO (2)** questions only.

ARAHAN:
*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **DUA (2)** soalan sahaja.*

QUESTION 1
SOALAN 1

CLO2
C2

(a) Based on the illustration in **Figure B1**, identify the effect of soil use towards the hydrological cycle.
*Berdasarkan kepada ilustrasi dalam **Rajah B1**, kenalpasti kesan penggunaan tanah terhadap kitaran hidrologi.*



Before construction After construction

Figure B1 / *Rajah B1*

[5 marks]
[*5 markah*]

CLO2
C3

(b) Rainfall with intensity of 150mm/hr fell on catchment area of 300ha for 8 hours. Measured runoff during this period was 780 x $10^3 m^3$. Calculate the amount of water lost from this 8 hours rainfall. (1ha = 10 000m^2)
Keamatan hujan sebanyak 150mm/hr yang turun ke atas satu kawasan tadahan yang luasnya 300 ha selama 8 jam. Air larian yang diukur sepanjang tempoh ini

direkodkan sebanyak 780 x $10^3 m^3$. *Kirakan jumlah kehilangan air bagi tempoh hujan 8 jam ini. (1ha = 10 000m^2)*

[10 marks]
[*10 markah*]

CLO2 C4

(c) Estimate the evapotranspiration loses for the area in cm/yr if the drainage area given is 2.59 x $10^{10}m^2$, the mean annual runoff is 19.82m^3/s and the average annual rainfall is 20cm.

Anggarkan kehilangan sejat-transpirasi bagi kawasan ini dalam unit cm/yr jika luas kawasan aliran diberi adalah 2.59 x $10^{10}m^2$, purata kadaralir tahunan sebanyak 19.82m^3/s dan purata kedalaman hujan tahunan ialah 20cm.

[10 marks]
[*10 markah*]

QUESTION 2
SOALAN 2

CLO2 C2

(a) Identify **FIVE** (5) rainfall characteristics.

*Kenalpasti **LIMA** (5) ciri-ciri hujan.*

[5 marks]
[*5 markah*]

CLO2 C3

(b) Calculate the mean areal precipitation for the following data in **Table B2(b)** using the Polygon Thiessen Method.

*Kira hujan purata bagi data yang diberi dalam **Jadual B2(b)** menggunakan Kaedah Polygon Thiessen.*

Table B2(b) / *Jadual B2(b)*

Station No.	Precipitation (mm)	Area of Polygon Thiessen (km^2)
1	35	18
2	32	20
3	28	24
4	46	17

[10 marks]
[*10 markah*]

CLO2
C4

(c) **Table B2(c)** shows the X station rainfall and average annual rainfall of 8 stations nearby. Analyze the consistency of annual rainfall at the X station with the corrective action of inconsistency using Double Mass Curve Method.

Jadual B2(c) *menunjukkan data hujan stesen X dan purata hujan tahunan bagi 8 stesen berhampiran. Analisis kekonsistenan bagi data hujan tahunan stesen X dengan melakukan pembetulan terhadap data yang tidak konsisten menggunakan Kaedah Lengkung Jisim Kembar.*

Table B2(c) / *Jadual B2(c)*

Year	Rainfall at X Station (cm)	Average Rainfall of 8 Station (cm)
2013	30	55
2014	27	50
2015	26	28
2016	28	19
2017	55	37
2018	58	57

[10 marks]
[*10 markah*]

QUESTION 3
SOALAN 3

CLO2
C2

(a) Identify **FIVE (5)** types of method to measure stream flow.
*Kenalpasti **LIMA (5)** jenis kaedah untuk mengukur aliran sungai.*

[5 marks]
[5 markah]

Table B3 / *Jadual B3*

Distance from river bank (m) ***Jarak dari tebing (m)***	**Vertical depth (m)** ***Kedalaman pugak (m)***	**Current Meter Reading**					
		0.6D		**0.2D**		**0.8D**	
		Rotation	**Time (s)**	**Rotation**	**Time (s)**	**Rotation**	**Time (s)**
1.0	0.2	9	50				
2.0	0.36	14	50				
4.0	0.82	25	50				
6.0	1.30			34	50	31	50
8.0	1.44			39	50	33	50
10.0	1.32			32	50	29	50
12.0	0.84	22	50				
14.0	0.58	16	50				
16.0	0.30	12	50				

Table B3 shows the current meter gauging data for Sungai Ketereh, by using the Mean Section Method.
***Jadual B3** menunjukkan bacaan data bagi Sungai Ketereh, dengan menggunakan Kaedah Purata Seksyen.*

CLO2
C3

(b) Calculate the velocity if $V = 0.5N + 0.04$.
Kirakan halaju jika $V = 0.5N + 0.04$.

[10 marks]
[10 markah]

CLO2
C4

(c) Estimate the discharge of the river.
Anggarkan kadar alir bagi sungai tersebut.

[10 marks]
[10 markah]

QUESTION 4
SOALAN 4

Below is the information of a medium density residential area in Kota Bharu.
Di bawah merupakan maklumat bagi kawasan kediaman kepadatan sederhana di Kota Bharu.

Residential area *Keluasan kawasan perumahan*	= 10hectares *= 10hektar*
Drainage type *Jenis saliran*	= minor drainage *= saliran minor*
Length of overland flow *Panjang saliran atas tanah*	= 80m *= 80m*
Length of the drain *Panjang saluran*	= 400m *= 400m*
Slope averange *Peratus kecerunan*	= 0.5% *= 0.5%*

CLO2
C2

(a) Identify the value of coefficients for Intensity Duration Frequency (IDF) Polynomial Equation if Recurrence Interval (ARI) is 5 years.
Kenalpasti nilai-nilai pekali bagi Persamaan Polimonial IDF sekiranya nilai ARI ialah 5 tahun.

[5 marks]
[*5 markah*]

CLO2
C3

(b) Calculate the Intensity Duration Frequency (IDF) for the area.
Kirakan keamatan IDF bagi kawasan tersebut.

[10 marks]
[*10 markah*]

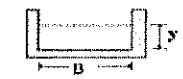
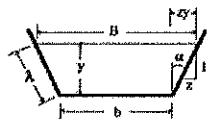
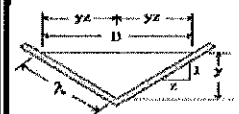
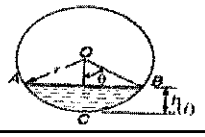
CLO2
C4

(c) Estimate the peak flow for the area.
Anggarkan aliran puncak bagi kawasan tersebut.

[10 marks]
[*10 markah*]

SOALAN TAMAT

LIST OF FORMULA

CROSS SECTION	AREA, A	WET PERIMETER, P	WIDTH
 Rectangular Channel	By	$B + 2y$	B
 Trapezoidal Cross Section	$\frac{1}{2}y(B + b)$		b + 2zy
		b + $2y\sqrt{1 + z^2}$	
 Triangular Channel	$\frac{1}{2}By$	$2y\sqrt{1 + z^2}$	$2zy$
	y^2z		
	$r^2\theta - \frac{r^2 sin2\theta}{2}$	$2\theta r$	$(sin\frac{1}{2}\theta)d$
	θ in radian		

1. $Q = A\frac{1}{N}m^{2/3}\sqrt{S_o}$
2. $E = y + \frac{v^2}{2g}$
3. $\frac{y_2}{y_1} = \frac{1}{2}\left(\sqrt{1 + 8Fr_1^2} - 1\right)$
4. $y_c = \sqrt[3]{\frac{q^2}{g}}$
5. $y_c = \frac{2}{3}E_{min}$
6. $F_r = \frac{v}{\sqrt{gy}}$
7. $E_L = \frac{(y_2 - y_1)^3}{4y_1y_2}$
8. $P_L = \rho gQE_L$
9. $P_o = \rho gQH$
10. $\eta = \frac{Po}{Pi}$
11. $h_L = \frac{flQ^2}{3d^5}$
12. $\eta = \frac{\sum_i H_i}{\sum_i \left(H_i/\eta_i\right)}$
13. $\eta = \frac{\sum_i Q_i}{\sum_i \left(Q_i/\eta_i\right)}$
14. $\Sigma\, Inflows - \Sigma\, Outflows = \Delta Storages$
15. $P - R - ET = \Delta S$

DISCHARGE FORM:

Distance from left water edge (m)	Vertical depth (m)	Stream depth (m)	Time (s)	Revolution	Revolution per second	**Velocity (m/s) at**			Segment width (m)	Average vertical depth (m)	Segment area (m^2)	**Discharge (m^3/s)**
						Stream depth	**Average vertical depth**	**Average cross section**				