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BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR
SESI JUN 2016

DCC6213 : HYDRAULICS AND HYDROLOGY

TARIKH : 25 OKTOBER 2016
TEMPOH : 2.30 PM – 4.30 PM (2 JAM)

Kertas ini mengandungi SEPULUH (7) halaman bercetak.

Bahagian A: Struktur (2 soalan)

Bahagian B: Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

target.

chapter 1

chapter 2.

Chapter 5

Chapter 6

Chapter 7.

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.

QUESTION 1**SOALAN 1**CLO1
C1

- (a) Define Hydraulics and Hydrology

Takrifkan Hidraulik dan Hidrologi

[5 marks] ✓

[5 markah]

CLO 1
C3

- b) Water flows in the canal of trapezoidal cross section is shown in Figure A1. The bottom drops 35cm per 2500 cm of length. The canal is lined with new smooth concrete ($n = 0.011$). Calculate the Flow rate, Specific energy, Froude number, type of flow and type of hydraulic jump for this flow.

Air mengalir di dalam sebuah saluran berbentuk trapezoid seperti dalam Rajah A1. Dasar saluran turun 35cm per 2500cm panjang. Saluran ini baharu dibina daripada konkrit yang licin ($n = 0.011$). Kirakan kadar alir, tenaga tentu, Nombor Froud, jenis aliran dan jenis lompatan hidraulik bagi aliran tersebut.

Section A

Q1 :- chapter 1 (Definition).
- chapter 2.

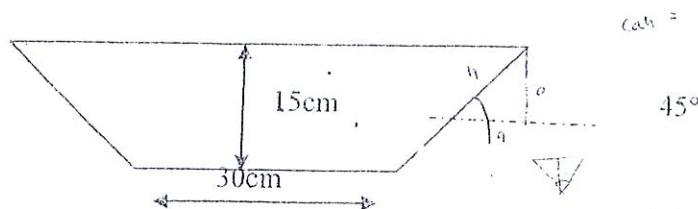


Figure A1/Rajah A1

[20 marks] ✓

[20 markah]

Amber

Vadimov's complex
of oligomers

QUESTION 2

chapter 4 & chapter 5 & chapter 3*

SOALAN 2

(Chapter 2)

- CLO1 a) In an experiment using a pump, it was found that the water flow rate is $0.117 \text{ m}^3/\text{s}$,
 C2 when the relevant head is 6 meters. If the pump efficiency is at 72%, determine
 the input power of the pump.

Dalam suatu ujian menggunakan sebuah pam, didapati bahawa air mengalir pada kadar $0.117 \text{ m}^3/\text{s}$, apabila turus yang berkaitan adalah 6 meter. Jika kecekapan pam tersebut adalah pada tahap 72%, tentukan kuasa masukan bagi pam.

$$\text{PO} = \rho g H Q$$

$$\eta = \frac{\text{PO}}{\text{Pi}} \times 100\%$$

$$\text{Pi} = 2\pi N T$$

Force =
rotation

[5 marks] ✓

[5 markah]

- CLO1 b) A centrifugal pump has the features as given in the Table A2 at a constant speed of. The pump is used to pump water as high as 10 m by using 20 cm diameter of pipe and 100 m length of pipe. If the friction coefficient, f for this pipe is 0.0005.
 C3 i. Plot the graph of head versus discharge (if the pump is fixed in series).
 ii. Calculate the discharge, head and output power of a pump at operational point.

Satu pam empar mempunyai ciri-ciri seperti yang diberi dalam Jadual A2 pada kelajuan malar. Pam tersebut digunakan untuk mengepam air setinggi 10 m dengan menggunakan paip yang berdiameter 20cm dan panjang paip ialah 100 m. Jika pekali geseran, f bagi paip ialah 0.0005.

- i. Plotkan graf bagi turus pam melawan kadar alir, jika pam dipasang secara bersiri.
 ii. Kirakan kadar alir, turus dan kuasa keluar bagi pam pada titik operasi.

Table A2 / Jadual A2

Q (m^3/s)	0	0.17	0.24	0.30	0.39	0.45
H (m)	20	19	18	17	14.5	10

output $P_o = \rho g H Q$ Head
 $P_o = \rho g H Q$ Power
 $P_i = 2\pi N T$ $W_w = q \cdot g \cdot h$

[20 marks] ✓

[20 markah]

input : $\frac{P_o}{P_i} \times 100\%$

SECTION B : 50 MARKS

BAHAGIAN B : 50 MARKAH

INSTRUCTION:

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

ARAHAN:

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

QUESTION 1

SOALAN 1

- CLO2 C3 (a) Sketch a complete hydrological cycle

Lukarkan kitaran hidrologi yang lengkap

[10 marks]

[10 markah]

- CLO2 C4 (b) Estimate the mean areal precipitation using the Isohyetal method for the data given in Table B1.

Anggarkan purata hujan kawasan dengan menggunakan kaedah Isohyet bagi data dalam Jadual B1.

Table B1/ Jadual B1

Isohyets Isohyet (cm)	0 – 7.5	7.5 – 12.5	12.5 – 19.0	19.0 – 25.5	25.5 – 30.5	30.5 – 36.0
Area Luas (km ²)	34	27	40	25	36	29

[15 marks]

[15 markah]

QUESTION 2

Chapter 5

SOALAN 2

165

CLO2

C3

- a) The normal annual precipitation at station A, B, C and D are 80.97 cm, 67.59 cm, 76.28 cm and 92.01 cm respectively. In a certain year, the data at station D was missing due to a faulty gauge. Station A, B and C recorded annual precipitations of 91.11 cm, 72.23 cm and 79.89 cm respectively. Calculate the missing data at station D by using;

- Arithmetic Mean Method [4 marks]
- Normal Ratio Method [6 marks]

Hujan tahunan normal di stesen A, B, C dan D masing-masing ialah 80.97 cm, 67.59 cm, 76.28 cm dan 92.01 cm. Dalam satu tahun tertentu, data di stesen D telah hilang disebabkan oleh tolok rosak. Stesen A, B dan C direkodkan hujan tahunan 91.11 cm, 72.23 cm dan 79.89 cm masing-masing. Kirakan data yang hilang di stesen D dengan menggunakan

- Kaedah Purata Aritmetik. [4 markah]
- Kaedah Nisbah Normal [6 markah]

CLO2

C4

Quadrant
method

- b) Station X failed to report the rainfall recorded during a storm. By referring to east-west and north-south axes set up that has been at station X, coordinates the 4 surrounding gauges, in which the nearest to station X in the respective quadrants, are (12,17), (-10,7), (-14,11) and (7,-17) km respectively. Determine the missing rainfall at X, if the storm at the four surrounding gauges are 75, 91, 70 and 59 mm respectively.

Stesen X gagal melaporkan hujan yang direkodkan semasa ribut. Dengan merujuk kepada paksi timur-barat dan utara-selatan yang dibina pada stesen X, koordinat 4 tolok sekitarnya, yang mana yang paling hampir dengan stesen X dalam kuadran berkenaan masing-masing ialah (12,17), (-10,7), (-14,11) dan (7,-17) km. Tentukan hujan yang hilang di X, jika hujan ribut pada empat tolok sekitarnya masing-masing ialah 75, 91, 70 dan 59 mm.

[15 marks]

[15 markah]

Station	A	B	C	D
P - Storm precip. ratio	91.11	72.23	79.89	-
N - Normal annual	80.97	67.59	76.28	92.01

SULIT

$$P_n = \frac{92.01}{3} \left[\frac{91.11}{80.97} + \frac{72.23}{67.59} + \frac{79.89}{76.28} \right]$$

$$= 99.402$$

QUESTION 3**SOALAN 3**CLO 2
C3

- a) Interpret TWO (2) methods used in stream flow measurement

Tafsirkan DUA (2) kaedah yang digunakan bagi pengukuran kadar alir.

[6 marks]

[6 markah]

CLO 2
C4

- b) Determine stream flow based on the given data in the **Table B3** by using a velocity area method. Use mean section method and all the calculation must be to two decimal places. The rating equation of the current meter is $v = 0.51N + 0.03$.

Tentukan kadar alir bagi data dalam Jadual B3 menggunakan kaedah halaju luas. Gunakan kaedah purata keratan dan semua pengiraan hendaklah dibuat kepada 2 titik perpuluhan. Persamaan meter arus yang digunakan adalah $v = 0.51N + 0.03$.

Table B3 / Jadual B3

Distance from the edge (m) <i>Jarak dari tebing (m)</i>	Depth (m) <i>Kedalaman (m)</i>	Stream depth <i>Kedalaman sungai</i>	Revolutions of a current meter <i>Pusingan meter arus</i>	Duration of observation (s) <i>Tempoh pemerhatian (s)</i>
0	0	0	0	0
1.0	1.1	0.6D	39	100
3.0	2.0	0.6D	58	100
5.0	2.5	0.6D	112	150
7.0	2.0	0.6D	90	100
9.0	1.7	0.6D	45	100
11.0	1.0	0.6D	30	100

[19 marks]

[19 markah]

QUESTION 4**SOALAN 4 ✓***Chapter 7.*CLO2
C3

- a) List FIVE (5) advantages in using Manual Saliran Mesra Alam (MSMA) in designing urban drainage.

Senaraikan LIMA (5) kebaikan penggunaan Manual Saliran Mesra Alam dalam merekabentuk saliran bandar

[5 marks]

[5 markah]

CLO2
C4

- b) Estimate the design peak flow for a residential area in Kuantan, Pahang according to the area characteristic as below:

Catchment area	= $4.3 \times 10^5 \text{ m}^2$
Density of residential area	= medium density
Type of drainage	= minor system
Overland flow	= 100 m
Drainage flow	= 230 m
Average slope of catchment area	= 0.2%
Type of surface	= paved surface ($n=0.015$)

Anggarkan rekabentuk kadar alir puncak bagi sebuah kawasan perumahan di Kuantan, Pahang berdasarkan ciri-ciri kawasan berikut:

Luas kawasan tадahan	= $4.3 \times 10^5 \text{ m}^2$
Kepadatan kawasan	= sederhana padat
Jenis saliran	= system minor
Jarak aliran atas permukaan	= 100m
Jarak saliran	= 230m
Purata keceriman kawasan	= 0.2%
Jenis permukaan	= berturap ($n=0.015$)

[20 marks]

[20 markah]

SOALAN TAMAT

D. NON-UNIFORM FLOW IN AN OPEN CHANNEL

1. $E = y + v^2/2g$

4. $Fr = V / (gy)^{1/2}$

2. $y_c = (q^2/g)^{1/3}$

5. $y_t = y_2/2 [\sqrt{1 + 8Fr_2^2} - 1]$

3. $Sc = (qn / y_c^{5/3})^2$

6. $Q = A \times m^{2/3} \times S^{1/2}$

E. PUMP

1. $P_o = \rho g H Q$

2. $PI = 2\pi n T$

$P_L = 2\pi N L$

3. $H_f = f L Q^2 / 3d^5$

$H_L = f L Q^2 / 3d^5$

4. $H_{strm} = H_{stb} + H_f$

$H_{sys} = H_s + H_L$

5. $\eta = \frac{Q}{(Q_A/\eta_A) + (Q_B/\eta_B)}$

6. $\eta = \frac{H}{(H_A/\eta_A) + (H_B/\eta_B)}$

(Q) 

DCC 6213 HYDRAULIC AND HYDROLOGY

Specific resistance of water

$$R_s = g \cdot \frac{v^2}{2g} = \frac{v^2}{2}$$

$$R_s = g \cdot \frac{Q^2}{2gF^2} = \frac{Q^2}{2F^2}$$

for a rectangular

$$R_s = \frac{q^2}{2gB^2}$$

$$CD = BC = \sqrt{q^2}$$

$$\text{Cross} = B \cdot BC$$

$$CF \cdot NC = J_{BC}$$

Flow rate

$$\frac{N}{J_{BC}}$$

$$\text{Speed} = V \cdot L$$

$$\text{Cross} = B \cdot V$$

$$V = \sqrt{\frac{q^2}{B}} = \sqrt{J_{BC}}$$

constant discharge

$$Q = B \cdot V = \text{constant}$$

$$= B \cdot \frac{q^2}{B} = \frac{q^2}{B}$$

D

Area

constant area discharge

variable head constant discharge

Water head = $\frac{1}{2} \cdot g \cdot \text{distance}$ (head)

where $\frac{1}{2} \cdot g \cdot \text{distance} = \frac{1}{2} \cdot g \cdot Q^2 \cdot \frac{1}{2} \cdot F^2$