

(7)
SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2017

DBM3023 : ELECTRICAL ENGINEERING MATHEMATICS

TARIKH : 29 OKTOBER 2017

MASA : 2.30 PETANG - 4.30 PETANG (2 JAM)

Kertas ini mengandungi **DUA BELAS (12)** halaman bercetak.

Bahagian A: Struktur (4 soalan)

Bahagian B: Struktur (2 soalan)

Dokumen sokongan yang disertakan : Kertas Graf & Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A : 75 MARKS**BAHAGIAN A : 75 MARKAH****INSTRUCTION:**

This section consists of **FOUR (4)** structured questions. Answer **THREE (3)** questions only.

ARAHAN :

Bahagian ini mengandungi EMPAT (4) soalan berstruktur. Jawab TIGA (3) soalan sahaja.

QUESTION 1**SOALAN 1**CLO2
C2

- (a) The data below shows weight of 50 students.
Data di bawah menunjukkan berat 50 orang pelajar.

45	64	64	69	53	51	64	65	49	67
58	61	50	46	53	54	47	50	53	68
54	52	47	57	61	50	66	48	65	63
48	61	51	56	54	69	64	51	59	53
57	61	59	56	54	68	65	55	59	55

- i. Construct a Frequency Distribution Table for the data above by using size class of 4.

Binakan Jadual Taburan Kekerapan bagi data di atas menggunakan saiz kelas 4.

[5 marks]

[5 markah]

- ii. From the Frequency Table above, draw a histogram.
Daripada Jadual Kekerapan di atas, lukiskan histogram.

[5 marks]

[5 markah]

CLO2
C3

(b)

- i. Based on the given data, calculate:
Berdasarkan data yang diberi, kirakan:

6 7 3 4 7 7 8 8 9

- a. Mean.

Min.

[3 marks]

[3 markah]

- b. Mode.

Mod.

[1 mark]

[1 markah]

- c. Median.

Median.

[2 marks]

[2 markah]

- ii. The recorded data in **Table 1(b)** is the number of residents living in each unit of an apartment. Give your answer to 4 decimal places.

Data yang direkodkan dalam Jadual 1(b) adalah bagi sejumlah penduduk yang tinggal dalam setiap unit di pangsapuri. Berikan jawapan anda sehingga 4 titik perpuluhan.

Class (x) <i>Kelas</i>	2	3	4	5	6	7	8
Frequency (f) <i>Kekerapan</i>	1	4	4	7	4	3	1

Table 1(b) / *Jadual 1(b)*

Calculate:

Kirakan:

- a. Mean.

Min.

[3 marks]

[3 markah]

- b. Mean Deviation.

Sisihan Min.

[3 marks]

[3 markah]

- c. Variance.

Varsians.

[3 marks]

[3 markah]

QUESTION 2

SOALAN 2

CLO2
C2

(a) Two coins are tossed simultaneously. Express the probability of obtaining:
Dua syiling yang sama dilambung secara serentak. Nyatakan kebarangkalian mendapat:

i. Two heads.
Dua kepala.

[3 marks]

[3 markah]

ii. Two tails.
Dua ekor.

[2 marks]

[2 markah]

iii. No tail.
Tiada ekor.

[1 mark]

[1 markah]

iv. A head.
Satu kepala.

[2 marks]

[2 markah]

v. A head and a tail.
Satu kepala dan satu ekor.

[2 marks]

[2 markah]

CLO2
C3

(b)

- i. There are three societies in a school. They are English Language Society (E), Malay Language Society (M) and Science Society (S). The information regarding students joining the societies is as follows:

Terdapat tiga persatuan di sebuah sekolah. Persatuan tersebut adalah Persatuan Bahasa Inggeris (E), Persatuan Bahasa Melayu (M) dan Persatuan Sains (S). Maklumat mengenai pelajar yang menyertai persatuan adalah seperti berikut:

$$P(E) = 0.4$$

$$P(E \cup M) = 0.65$$

$$P(E \cup S) = 0.8$$

$$P(E \cap M) = 0.15$$

$$P(E \cap S) = 0.2$$

$$P(M \cap S) = 0.2$$

$$P(E \cup M \cup S) = 0.95$$

A student is selected at random ~~from the school~~. Calculate the probability that the student is a member of all three societies:

Pelajar dipilih secara rawak daripada sekolah tersebut. Kirakan kebarangkalian pelajar adalah ahli ketiga-tiga persatuan:

[5 marks]

[5 markah]

- ii. A and B are two events whereby $P(B) = \frac{1}{5}$, $P(B|A) = \frac{1}{3}$ and $P(A|B) = \frac{1}{2}$.

A dan B adalah dua peristiwa di mana $P(B) = \frac{1}{5}$, $P(B|A) = \frac{1}{3}$ dan $P(A|B) = \frac{1}{2}$.

- a. Determine whether A and B independent events?

Tentukan adakah A dan B peristiwa tidak bersandar?

[2 marks]

[2 markah]

- b. Determine whether A and B mutually exclusive events?

Tentukan adakah A dan B peristiwa saling eksklusif?

[2 marks]

[2 markah]

- c. Calculate $P(A \cap B)$.

Kirakan $P(A \cap B)$.

[2 marks]

[2 markah]

- d. Calculate $(A \cup B)$.

Kirakan $P(A \cup B)$.

[4 marks]

[4 markah]

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QUESTION 3

SOALAN 3

CLO2
C2

- (a) By using the Definition $F(s) = \int_0^{\infty} e^{-st} f(t) dt$, compute the Laplace Transform of the given function below;

Dengan menggunakan , $F(s) = \int_0^{\infty} e^{-st} f(t) dt$ dapatkan Jelmaan Laplace bagi fungsi di bawah

i. $f(t) = 2k$

[5 marks]

[5 markah]

ii. $f(t) = \frac{e^{4t}}{2}$

[5 marks]

[5 markah]

CLO2
C3

(b)

- i. Transform the functions below by using first shift theorem:

Dapatkan Jelmaan Laplace bagi fungsi di bawah:

a. $f(t) = e^{2t} t^2$

[3 marks]

[3 markah]

b. $f(t) = e^{-2t} \sinh 3t$

[4 marks]

[4 markah]

- ii. Find the Laplace transform by using multiplication by t^n , for $f(t) = 2t \cos 4t$

Dapatkan Jelmaan Laplace dengan menggunakan 'multiplication by t^n ' untuk

$f(t) = 2t \cos 4t$.

[8 marks]

[8 markah]

QUESTION 4

SOALAN 4

CLO 2
C2

- (a) Determine the inverse Laplace Transform below:
Tentukan songsangan Jelmaan Laplace yang berikut:

i.
$$F(s) = \frac{5}{s+3} + \frac{5s}{s^2+16} - \frac{3}{s}$$

[2marks]

[2 markah]

ii.
$$F(s) = \frac{2s-2}{s^2+25}$$

[3 marks]

[3 markah]

iii.
$$F(s) = \frac{15}{s^2+4s+13}$$

[5 marks]

[5 markah]

CLO2
C3

- (b) By using the partial fraction, find the inverse Laplace Transform below:
Dengan menggunakan kaedah pecahan separa, cari songsangan bagi Jelmaan laplace berikut:

i.
$$F(s) = \frac{2s-1}{s^2-5s+6}$$

[7 marks]

[7 markah]

ii
$$F(s) = \frac{2s^2+7s+2}{s(s-1)^2}$$

[8 marks]

[8 markah]

SECTION B : 25 MARKS

BAHAGIAN B : 25 MARKAH

INSTRUCTION:

This section consists of **TWO (2)** structured questions. Answer **ONE (1)** question only.

ARAHAN:

Bahagian ini mengandungi DUA (2) soalan berstruktur. Jawab SATU (1) soalan sahaja.

QUESTION 5

SOALAN 5

CLO1
C2

(a)

- i. Convert the following equation into $AX=B$ form :

Tukarkan persamaan berikut kepada bentuk $AX=B$:

a. $4y - 6z = 5$
 $3x + 6y - 9z = -5$
 $-4x = 4$

[2 marks]

[2 markah]

b. $2x + 6z + 2 = 0$
 $x + 2y + 9z + 5 = 0$
 $6y - 6z = 5$

[2 marks]

[2 markah]

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- ii. Identify the real root by using the Newton Raphson method correct to 3 decimal places for $f(x) = x^3 - x - 1$ where $x_0 = \sqrt{2}$.

Kenalpasti punca sebenar dengan menggunakan kaedah Newton Raphson tepat kepada 3 titik perpuluhan bagi $f(x) = x^3 - x - 1$ dimana $x_0 = \sqrt{2}$.

[6 marks]

[6 markah]

CLO1
C3

- (b) Calculate the value of x_1, x_2 and x_3 by using Crout Method.
Kira nilai x_1, x_2 dan x_3 dengan menggunakan kaedah Crout.

$$2x_1 + x_2 + x_3 = 10$$

$$3x_1 + 2x_2 + 3x_3 = 18$$

$$x_1 + 4x_2 + 9x_3 = 16$$

[15 marks]

[15 markah]

QUESTION 6

SOALAN 6

CLO1
C2

- (a) Compute the First Order Differential Equation below :
Kirakan Persamaan Pembezaan Pertama dibawah :

i. $xy^2 dx - x^2y^2 dy = 0$

[4 marks]

[4 markah]

ii. $y' + \frac{x}{y} = 0$

[3 marks]

[3 markah]

iii. $\sin x dx + y^2 dy = 0$

[3 marks]

[3 markah]

CLO1
C3

(b)

- i. Solve $y' = \frac{y+x}{x}$ by using Homogeneous Equation Method.

Selesaikan $y' = \frac{y+x}{x}$ dengan menggunakan kaedah Persamaan Homogeneous.

[5 marks]

[5 markah]

- ii. Solve the Second Order Differential Equation below :

Selesaikan Persamaan Pembezaan Kedua dibawah :

a. $y'' - y' - 2y = 0$

[4 marks]

[4 markah]

b. $y'' - 3y' + 4y = 0$

[6 marks]

[6 markah]

SOALAN TAMAT

DESCRIPTIVE STATISTICS		
Number of class	$k = 1 + 3.33 \log n$	
Mean	$\bar{x} = \frac{\sum x}{n}$	$\bar{x} = \frac{\sum (fx)}{\sum f}$
Median	$\text{Median} = L_m + \left[\frac{\frac{N}{2} - F}{f_m} \right] C$	
Mode	$\text{Mode} = L_{Mo} + \left[\frac{d_1}{d_1 + d_2} \right] C$	
Quartile	$Q_k = L_{Q_k} + \left[\frac{\frac{kN}{4} - F}{f_{Q_k}} \right] C \quad ; k = 1, 2, 3$	
Decile	$D_k = L_{D_k} + \left[\frac{\frac{kN}{10} - F}{f_{D_k}} \right] C \quad ; k = 1, 2, 3, \dots, 9$	
Percentile	$P_k = L_{P_k} + \left[\frac{\frac{kN}{100} - F}{f_{P_k}} \right] C \quad ; k = 1, 2, 3, \dots, 99$	
Mean Deviation	$E = \frac{\sum x - \bar{x} }{n}$	$E = \frac{\sum (x - \bar{x} f)}{\sum f}$
Variance	$s^2 = \frac{\sum (x - \bar{x})^2}{n}$	$s^2 = \frac{\sum x_i^2 - n\bar{x}^2}{n}$
	$s^2 = \frac{\sum [(x - \bar{x})^2 f]}{\sum f}$	$s^2 = \frac{\sum fx^2}{\sum f} - \left[\frac{\sum fx}{\sum f} \right]^2$
Standard Deviation	$s = \sqrt{\text{var iance}}$	

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NUMERICAL METHOD		
Crout Method	$A = \begin{pmatrix} l_{11} & 0 & 0 \\ l_{21} & l_{22} & 0 \\ l_{31} & l_{32} & l_{33} \end{pmatrix} \begin{pmatrix} 1 & u_{12} & u_{13} \\ 0 & 1 & u_{23} \\ 0 & 0 & 1 \end{pmatrix}$	
Doolittle Method	$A = \begin{pmatrix} 1 & 0 & 0 \\ l_{21} & 1 & 0 \\ l_{31} & l_{32} & 1 \end{pmatrix} \begin{pmatrix} u_{11} & u_{12} & u_{13} \\ 0 & u_{22} & u_{23} \\ 0 & 0 & u_{33} \end{pmatrix}$	
Newton Raphson Method	$x_0 = \frac{1}{y_2 - y_1} \begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \end{vmatrix}$	$x_{n+1} = x_n - \frac{f(x)}{f'(x)}$

PROBABILITY	
$E = pn$	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
$P(B A) = \frac{P(B \cap A)}{P(A)}$	$P(A \cap B) = P(A) \cdot P(B)$
	$P(A \cap B) = P(A) \cdot P(B A)$

SOLUTION FOR 1 st ORDER DIFFERENTIAL EQUATION	
Homogeneous Equation $y = vx$ and $\frac{dy}{dx} = v + x \frac{dv}{dx}$	Linear Factors (Integrating Factors) $y \cdot IF = \int Q \cdot IF dx$ Where $IF = e^{\int P dx}$
	Logarithmic $a = e^{\ln a}$ $a^x = e^{x \ln a}$ $\int a^x dx = \frac{a^x}{\ln a} + c$
GENERAL SOLUTION FOR 2 nd ORDER DIFFERENTIAL EQUATION	
Equation of the form $a \frac{d^2 y}{dx^2} + b \frac{dy}{dx} + cy = 0$	
1. Real & different roots:	$y = Ae^{m_1 x} + Be^{m_2 x}$
2. Real & equal roots:	$y = e^{mx}(A + Bx)$
3. Complex roots:	$y = e^{\alpha x}(A \cos \beta x + B \sin \beta x)$

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LAPLACE TRANSFORM					
No.	$f(t)$	$F(s)$		$f(t)$	$F(s)$
1.	a	$\frac{a}{s}$	13.	$e^{-at} \sin \omega t$	$\frac{\omega}{(s+a)^2 + \omega^2}$
2.	at	$\frac{a}{s^2}$	14.	$e^{-at} \cos \omega t$	$\frac{s+a}{(s+a)^2 + \omega^2}$
3.	t^n	$\frac{n!}{s^{n+1}}$	15.	$\sinh \omega t$	$\frac{\omega}{s^2 - \omega^2}$
4.	e^{at}	$\frac{1}{s-a}$	16.	$\cosh \omega t$	$\frac{s}{s^2 - \omega^2}$
5.	e^{-at}	$\frac{1}{s+a}$	17.	$e^{at} \sinh \omega t$	$\frac{\omega}{(s-a)^2 - \omega^2}$
6.	te^{-at}	$\frac{1}{(s+a)^2}$	18.	$e^{-at} \sinh \omega t$	$\frac{\omega}{(s+a)^2 - \omega^2}$
7.	$t^n \cdot e^{at}, n=1,2,3$	$\frac{n!}{(s-a)^{n+1}}$	19.	$e^{-at} \cosh \omega t$	$\frac{s+a}{(s+a)^2 - \omega^2}$
8.	$t^n \cdot f(t)$	$(-1)^n \frac{d^n}{ds^n} [F(s)]$	20.	$f_1(t) + f_2(t)$	$F_1(s) + F_2(s)$
9.	$\sin \omega t$	$\frac{\omega}{s^2 + \omega^2}$	21.	$\int_0^t f(u) du$	$\frac{F(s)}{s}$
10.	$\cos \omega t$	$\frac{s}{s^2 + \omega^2}$	22.	$f(t-a)u(t-a)$	$e^{-as} F(s)$
11.	$t \sin \omega t$	$\frac{2\omega s}{(s^2 + \omega^2)^2}$	23.	First derivative $\frac{dy}{dt}, y'(t)$	$sY(s) - y(0)$
12.	$t \cos \omega t$	$\frac{s^2 - \omega^2}{(s^2 + \omega^2)^2}$	24.	Second derivative $\frac{d^2 y}{dt^2}, y''(t)$	$s^2 Y(s) - sy(0) - y'(0)$