

SULIT



**KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI**

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

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI II : 2024/2025

DBM30043 : ELECTRICAL ENGINEERING MATHEMATICS

TARIKH : 16 MEI 2025

MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **LAPAN (8)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTION:

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

ARAHAN:

Bahagian ini mengandungi EMPAT (4) soalan struktur. Jawab SEMUA soalan.

QUESTION 1**SOALAN 1**

CLO1

- (a) Table 1(a) shows the distribution of monthly electricity consumption of 50 consumers in a locality.

Jadual 1(a) menunjukkan taburan penggunaan bulanan elektrik bagi 50 orang pengguna di dalam sebuah lokaliti.

Table 1(a) / *Jadual 1(a)*

Monthly consumption (in unit) <i>Penggunaan bulanan (dalam unit)</i>	Number of consumers <i>Jumlah pengguna</i>
81 - 90	10
91 - 100	9
101 - 110	15
111 - 120	10
121 - 130	6

Based on the table, calculate:

Berdasarkan jadual, kirakan:

- i. Mode

Mod

[4 marks]

[4 markah]

- ii. Variance

Varian

[6 marks]

[6 markah]

- CLO1 (b) Given a set of data 3, 7, 6, 12, 8, 4, x and 12. Calculate the value of:
Diberi satu set data 3, 7, 6, 12, 8, 4, x dan 12. Kira nilai bagi:
- i. x , if mean is 8
 x , jika min adalah 8
- [3 marks]
[3 markah]
- ii. Standard deviation
Sisihan piawai
- [5 marks]
[5 markah]
- CLO1 (c) A drawer contains 5 white shirts, 8 black shirts and 9 yellow shirts. Two shirts are selected at random without replacement. Determine the probability of choosing:
Sebuah laci mengandungi 5 helai baju berwarna putih, 8 helai baju berwarna hitam dan 9 helai baju berwarna kuning. Dua helai baju dipilih secara rawak tanpa diganti. Tentukan kebarangkalian memilih:
- i. Shirts with the same colour
Kemeja yang berwarna sama
- [4 marks]
[4 markah]
- ii. Shirts that have the combination of white and black colour
Kemeja yang mempunyai gabungan warna putih dan hitam
- [3 marks]
[3 markah]

QUESTION 2**SOALAN 2**

CLO1

- (a) Based on the linear equations below:

Berdasarkan persamaan linear di bawah:

$$2x - y - 2z = -1$$

$$-4x + 6y = 13 - 3z$$

$$-4x - 2y + 8z = -6$$

- i. Construct Matrix L and Matrix U using the Crout method

Bina Matriks L dan U menggunakan Kaedah Crout

[10 marks]

[10 markah]

- ii. Then, calculate value of
- x
- ,
- y
- and
- z

Kemudian, kira nilai x , y dan z

[8 marks]

[8 markah]

CLO1

- (b) By using the Newton Raphson Method, determine the root for the function
- $f(x) = x^4 - x - 10$
- correct to 3 decimal places. Given that
- $x_0 = 2.5$
- .

Dengan menggunakan Kaedah Newton Raphson, tentukan fungsi bagi *$f(x) = x^4 - x - 10$ tepat kepada 3 tempat perpuluhan. Diberi $x_0 = 2.5$.*

[7 marks]

[7 markah]

QUESTION 3**SOALAN 3**

- CLO1 (a) Express the order and degree of the following differential equations:
Nyatakan peringkat dan darjah bagi persamaan pembezaan yang berikut:
- i. $4\left(\frac{d^3y}{dx^3}\right) - \left(\frac{d^2y}{dx^2}\right)^3 + 5\frac{dy}{dx} + 4 = 0$
[2 marks]
[2 markah]
- ii. $\left(\frac{d^4y}{dx^4}\right)^2 + \left(\frac{dy}{dx}\right) - \cos^3 x = 0$
[2 marks]
[2 markah]
- CLO1 (b) Solve the following differential equations by applying the method stated:
Selesaikan persamaan berikut dengan menggunakan kaedah yang dinyatakan:
- i. $\frac{dy}{dx} = e^{5x} - 4x + 3$; Direct Integration
; Pengamiran langsung
[5 marks]
[5 markah]
- ii. $\frac{dy}{dx} + \frac{y}{x} = x^2$; Integrating factors
; Faktor Pengamiran
[6 marks]
[6 markah]

CLO1 (c) Determine the general solution for the following differential equations:

Tentukan penyelesaian am bagi persamaan pembezaan berikut:

i. $2 \frac{d^2 y}{dx^2} - 3 \frac{dy}{dx} = 2y$

[5 marks]

[5 markah]

ii. $\frac{d^2 y}{dx^2} + 7y = 3 \frac{dy}{dx}$

[5 marks]

[5 markah]

QUESTION 4

SOALAN 4

- CLO1 (a) Determine the Laplace Transform for $f(t) = 2e^{3t}$ by using the definition of Laplace Transform, $F(s) = \int_0^{\infty} e^{-st} f(t) dt$.
Tentukan Jelmaan Laplace bagi fungsi $f(t) = 2e^{3t}$ dengan menggunakan definisi Jelmaan Laplace, $F(s) = \int_0^{\infty} e^{-st} f(t) dt$.

[5 marks]

[5 markah]

- CLO1 (b) Calculate the Laplace Transform for the following functions by using the methods stated:
Kirakan Jelmaan Laplace bagi fungsi di bawah dengan menggunakan kaedah yang dinyatakan:

- i. $\mathcal{L}\{10 + 3 \cosh 6t - 4t^2\}$; Table of Laplace Transform
 ; *Jadual Jelmaan Laplace*

[3 marks]

[3 markah]

- ii. $\mathcal{L}\{e^{-7t} \sin 3t\}$; First Shift Theorem
 ; *Teorem Anjakan Pertama*

[3 marks]

[3 markah]

- iii. $\mathcal{L}\{te^{2t}\}$; Multiplication with t^n
 ; *Pendaraban dengan t^n*

[4 marks]

[4 markah]

- CLO1 (c) Determine the Inverse Laplace Transform for the following functions by using the methods stated:

Tentukan Jelmaan Laplace Songsang bagi fungsi – fungsi yang berikut dengan menggunakan kaedah yang dinyatakan:

i. $F(s) = \frac{3s}{s^2+4} + \frac{4}{2s-10}$; Table of Laplace Transform
; *Jadual Jelmaan Laplace*

[3 marks]
[3 markah]

ii. $F(s) = \frac{1}{s(s-2)}$; Partial Fraction Method
; *Kaedah Pecahan Separa*

[7 marks]
[7 markah]

SOALAN TAMAT

FORMULA DBM30043 - ELECTRICAL ENGINEERING MATHEMATICS

DESCRIPTIVE STATISTICS		
Number of class	<i>Sturges Rule, $k = 1 + 3.33 \log n$</i>	<i>Rule of Thumb, $2^k > n$</i>
Mean	$\bar{x} = \frac{\sum x}{n}$	$\bar{x} = \frac{\sum (fx)}{\sum f}$
Median	$Median = L_m + \left(\frac{\frac{N}{2} - F}{f_m} \right) C$	
Mode	$Mode = L_{M_o} + \left(\frac{d_1}{d_1 + d_2} \right) C$	
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	$s^2 = \frac{\sum (x - \bar{x})^2}{n}$	$s^2 = \frac{\sum_{i=1}^n x_i^2 - n\bar{x}^2}{n}$
	$s^2 = \frac{\sum [(x - \bar{x})^2 f]}{\sum f}$	$s^2 = \frac{\sum fx^2}{\sum f} - \left[\frac{\sum fx}{\sum f} \right]^2$
Standard Deviation	$s = \sqrt{variance}$	

NUMERICAL METHOD		
Crout Method	$A = \begin{pmatrix} l_{11} & 0 & 0 \\ l_{21} & l_{22} & 0 \\ l_{31} & l_{32} & l_{33} \end{pmatrix} \begin{pmatrix} 1 & u_{12} & u_{13} \\ 0 & 1 & u_{23} \\ 0 & 0 & 1 \end{pmatrix}$	$Ly = b$ $Ux = y$
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	$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$	
False Position Method	$x_0 = \frac{1}{y_2 - y_1} \begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \end{vmatrix}$	
PROBABILITY		
$E = pn$	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	
$P(B A) = \frac{P(B \cap A)}{P(A)}$	$P(A \cap B) = P(A) \cdot P(B)$	
	$P(A \cup B) = P(A) + P(B)$	
	$P(A \cap B) = P(A) \cdot P(B A)$	
SOLUTION FOR 1 st ORDER DIFFERENTIAL EQUATION		
Logarithmic $a = e^{\ln a}$ $a^x = e^{x \ln a}$ $\int a^x dx = \frac{a^x}{\ln a} + c$	Homogeneous Equation $y = vx$ and $\frac{dy}{dx} = v + x \frac{dv}{dx}$	
	Linear Factors (Integrating Factors) $\frac{dy}{dx} + Py = Q$ $y \cdot IF = \int Q \cdot IF dx$ Where $IF = e^{\int P dx}$	
GENERAL SOLUTION FOR 2 nd ORDER DIFFERENTIAL EQUATION		
Equation of the form	$a \frac{d^2 y}{dx^2} + b \frac{dy}{dx} + cy = 0$	
Quadratics Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	
1. Real & different roots	$y = Ae^{m_1 x} + Be^{m_2 x}$	
2. Real & equal roots	$y = e^{m x} (A + Bx)$	
3. Complex roots	$y = e^{\alpha x} (A \cos \beta x + B \sin \beta x)$	

LAPLACE TRANSFORM					
No.	$f(t)$	$F(s)$	No.	$f(t)$	$F(s)$
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 $\frac{d^2 y}{dt^2}, y''(t)$	$s^2 Y(s) - sy(0) - y'(0)$

DIFFERENTIATION			
1.	$\frac{d}{dx}(k) = 0, \quad k \text{ is constant}$	2.	$\frac{d}{dx}(ax^n) = anx^{n-1} \quad [\text{Power Rule}]$
3.	$\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$	4.	$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx} \quad [\text{Product Rule}]$
5.	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2} \quad [\text{Quotient Rule}]$	6.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du} \quad [\text{Chain Rule}]$
7.	$\frac{d}{dx}(e^x) = e^x$	8.	$\frac{d}{dx}(e^{ax+b}) = e^{ax+b} \times \frac{d}{dx}(ax+b)$
9.	$\frac{d}{dx}(\ln x) = \frac{1}{x}$	10.	$\frac{d}{dx}[\ln ax+b] = \frac{1}{ax+b} \times \frac{d}{dx}(ax+b)$
11.	$\frac{d}{dx}(\sin x) = \cos x$	12.	$\frac{d}{dx}(\cos x) = -\sin x$
13.	$\frac{d}{dx}(\tan x) = \sec^2 x$	14.	$\frac{d}{dx}[\sin(ax+b)] = \cos(ax+b) \times \frac{d}{dx}(ax+b)$
15.	$\frac{d}{dx}[\cos(ax+b)] = -\sin(ax+b) \times \frac{d}{dx}(ax+b)$	16.	$\frac{d}{dx}[\tan(ax+b)] = \sec^2(ax+b) \times \frac{d}{dx}(ax+b)$
17.	$\frac{d}{dx}[\sin^n u] = n \sin^{n-1} u \times \cos u \times \frac{du}{dx}$	18.	$\frac{d}{dx}[\cos^n u] = n \cos^{n-1} u \times -\sin u \times \frac{du}{dx}$
19.	$\frac{d}{dx}[\tan^n u] = n \tan^{n-1} u \times \sec^2 u \times \frac{du}{dx}$		

INTEGRATION			
1.	$\int ax^n dx = \frac{ax^{n+1}}{n+1} + c \quad ; \{n \neq -1\}$	2.	$\int (ax+b)^n dx = \frac{(ax+b)^{n+1}}{(a)(n+1)} + c \quad ; \{n \neq -1\}$
3.	$\int k dx = kx + c, \quad k \text{ is constant}$	4.	$\int_a^b f(x) dx = F(b) - F(a)$
5.	$\int \frac{1}{x} dx = \ln x + c$	6.	$\int \frac{1}{ax+b} dx = \frac{1}{a} \times \ln ax+b + c$
7.	$\int e^x dx = e^x + c$	8.	$\int e^{ax+b} dx = \frac{1}{a} \times e^{ax+b} + c$
9.	$\int \sin x dx = -\cos x + c$	10.	$\int \cos x dx = \sin x + c$
11.	$\int \sec^2 x dx = \tan x + c$		
12.	$\int \sin(ax+b) dx = -\frac{1}{a} \times \cos(ax+b) + c$		
13.	$\int \cos(ax+b) dx = \frac{1}{a} \times \sin(ax+b) + c$		
14.	$\int \sec^2(ax+b) dx = \frac{1}{a} \times \tan(ax+b) + c$		