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 : 2025/2026

DBM30043 : ELECTRICAL ENGINEERING MATHEMATICS

TARIKH : 29 APRIL 2026
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas soalan ini mengandungi **TUJUH (7)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

TERBUKA

INSTRUCTION:

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

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1

a) The following table shows the distribution of the number of computers sold during the past 28 weeks at Computer Store Melaka.

Jadual berikut menunjukkan taburan bilangan komputer yang dijual sepanjang 28 minggu yang lalu di Kedai Komputer Melaka.

Table 1 / *Jadual 1*

Week /*Minggu*	Number of computers sold / *Bilangan computer terjual*
1 – 4	16
5 – 8	20
9 – 12	28
13 – 16	24
17 – 20	5
21 – 24	11
25 – 28	16

Calculate:

Kirakan:

i. Mode

Mod

[3 marks]

[*3 markah*]

ii. Mean deviation

Sisihan min

[7 marks]

[*7 markah*]

CLO1

b) The data below shows total marks scored by 6 students in 3 subjects.

Data di bawah menunjukkan jumlah markah yang diperolehi oleh 6 orang pelajar dalam 3 mata pelajaran.

234 184 125 245 158 248

Calculate:

Kirakan:

i. Mean

Min

[3 marks]
[*3 markah*]

ii. Standard deviation

Sisihan piawai

[5 marks]
[*5 markah*]

CLO1

c) A bag contains of 4 red balls and 5 white balls. Two balls are picked at random and replaced. Find:

Sebuah beg mengandungi 4 biji bola berwarna merah dan 5 biji bola berwarna putih. Dua biji bola dipilih secara rawak dan diletakkan semula. Cari:

i. $P(R \cap W)$

[3 marks]
[*3 markah*]

ii. The probability if both balls are the same colour

Kedua-dua biji bola mempunyai warna yang sama

[4 marks]
[*4 markah*]

QUESTION 2

SOALAN 2

CLO1

(a) Given the linear equations are as follow:

Diberi persamaan linear adalah seperti berikut:

$$x + y = 5 - z$$
$$2x - 4y - z = 6$$
$$-2x + 3y + z = 2$$

i. Construct Matrix L and Matrix U by using Crout Method

Bina matrik L dan U dengan menggunakan Kaedah Crout.

[10 marks]

[*10 markah*]

ii. Calculate the value of x, y and z.

Kira nilai x, y dan z.

[8 marks]

[*8 markah*]

CLO1

(b) Given a nonlinear equation $f(x) = 5x^2 + 2x - 3 = 0$ with an initial approximation, $x_0 = 1.5$. Find the root for the equation by using Newton-Raphson Method and give your answer correct to 3 decimal places.

Diberi satu persamaan tidak linear $f(x) = 5x^2 + 2x - 3 = 0$ *dengan nilai anggaran awal,* $x_0 = 1.5$. *Cari nilai punca bagi persamaan ini dengan menggunakan Kaedah Newton-Raphson dan berikan jawapan anda tepat kepada 3 tempat perpuluhan.*

[7 marks]

[*7 markah*]

QUESTION 3

SOALAN 3

CLO1 (a) Classify order and degree for the following equations.

Kelaskan peringkat dan darjah bagi persamaan-persamaan berikut:

i. $\left(\frac{d^3y}{dx^3}\right)^3 + 3\left(\frac{d^4y}{dx^4}\right)^2 + \frac{dy}{dx} = 3$

[2 marks]
[*2 markah*]

ii. $5\frac{dy}{dx} - \left(\frac{dy}{dx}\right)^3 + \frac{d^2y}{dx^2} = -\frac{1}{3}$

[2 marks]
[*2 markah*]

CLO1 (b) Solve the following differential equation into a particular or general solution.

Selesaikan persamaan berikut kepada bentuk penyelesaian khusus atau umum.

i. $\frac{dy}{dx} - \frac{y}{x} = xe^x$

[5 marks]
[*5 markah*]

ii. $y^3\frac{dy}{dx} = 4e^{3x} + 5\,;\quad given\ y = -2\quad and\quad x = 0$

$y^3\frac{dy}{dx} = 4e^{3x} + 5\,;\quad diberi\ y = -2\quad dan\quad x = 0$

[6 marks]
[*6 markah*]

CLO1 (c) Solve the following second order differential equation:

Selesaikan persamaan pembezaan peringkat kedua yang berikut:

i. $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 6y = 0$

[4 marks]
[*4 markah*]

ii. $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 5y = 0$

[6 marks]
[6 *markah*]

QUESTION 4

SOALAN 4

CLO1 (a) Compute the Laplace Transform for $f(t) = -3e^{4t}$ by using the definition of Laplace Transform, $F(s) = \int_0^\infty e^{-st} f(t)dt$.

Kirakan Jelmaan Laplace bagi $f(t) = -3e^{4t}$ *dengan menggunakan definisi Jelmaan Laplace,* $F(s) = \int_0^\infty e^{-st} f(t)dt$.

[5 marks]
[*5 markah*]

CLO1 (b) Determine the Laplace Transform for the following functions:

Tentukan Jelmaan Laplace bagi fungsi-fungsi yang berikut:

i. $f(t) = 3e^{4t} + 7\cos t - 5$; Linearity Property
$f(t) = 3e^{4t} + 7\cos t - 5$; *Teorem Kelinearan*

[3 marks]
[*3 markah*]

ii. $f(t) = e^{-2t}\cos 3t$; First Shift Theorem
$f(t) = e^{-2t}\cos 3t$; *Teorem Anjakan Pertama*

[3 marks]
[*3 markah*]

iii. $f(t) = 2t\,e^{-4t}$; Multiplication with t^n
$f(t) = 2t\,e^{-4t}$; *Pendaraban dengan* t^n

[4 marks]
[*4 markah*]

CLO1

(c) Determine the Inverse Laplace Transform for the following functions:

Tentukan Jelmaan Laplace Songsang bagi fungsi-fungsi berikut:

i. $F(s) = \frac{4}{2s-6} + \frac{6}{s^3}$; Use Table of Laplace Transform

$F(s) = \frac{4}{2s-6} + \frac{6}{s^3}$; *Guna Jadual Jelmaan Laplace*

[4 marks]
[*4 markah*]

ii. $F(s) = \frac{8}{s(s-4)}$; Use Partial Fraction Method

$F(s) = \frac{8}{s(s-4)}$; *Guna Kaedah Pecahan Separa*

[6 marks]
[*6 markah*]

SOALAN TAMAT

FORMULA DBM30043 - ELECTRICAL ENGINEERING MATHEMATICS

DESCRIPTIVE STATISTICS		
Number of class	*Sturges Rule,* $k = 1 + 3.33 \log n$	*Rule of Thumb,* $2^k > n$
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	$D_k = L_{D_k} + \left(\frac{\frac{kN}{10} - F}{f_{D_k}}\right) C; \quad k = 1, 2, 3 \ldots 9$	
Percentile	$P_k = L_{P_k} + \left(\frac{\frac{kN}{100} - F}{f_{P_k}}\right) C; \quad k = 1, 2, 3 \ldots 99$	
Mean Deviation	$E = \frac{\sum \lvert x - \bar{x} \rvert}{n}$	$E = \frac{\sum (\lvert x - \bar{x} \rvert f)}{\sum f}$
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

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

SOLUTION FOR 1st 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)

$\frac{dy}{dx} + Py = Q$

$y \bullet IF = \int Q \bullet IF \, dx$

Where $IF = e^{\int P dx}$

GENERAL SOLUTION FOR 2nd ORDER DIFFERENTIAL EQUATION

Equation of the form	$a\frac{d^2y}{dx^2} + b\frac{dy}{dx} + cy = 0$
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	$y = e^{mx}(A + Bx)$
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.	$t^n.e^{at}$, 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.	$t^n.f(t)$	$(-1)^n\frac{d^n}{ds^n}[F(s)]$	20.	$f_1(t)+f_2(t)$	$F_1(s)+F_2(s)$
9.	$\sin \omega t$	$\frac{\omega}{s^2+\omega^2}$	21.	$\int_o^t f(u)du$	$\frac{F(s)}{s}$
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 $\frac{d^2y}{dt^2}, y''(t)$	$s^2Y(s)-sy(0)-y'(0)$

DIFFERENTIATION			
1.	$\frac{d}{dx}(k) = 0\,, \quad k \text{ is constant}$	2.	$\frac{d}{dx}(ax^n) = anx^{n-1} \quad [Power\ Rule]$
3.	$\frac{d}{dx}\big(f(x) \pm g(x)\big) = f'(x) \pm g'(x)$	4.	$\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx} \quad [Product\ Rule]$
5.	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2} \quad [Quotient\ Rule]$	6.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du} \quad [Chain\ Rule]$
7.	$\frac{d}{dx}(e^x) = e^x$	8.	$\frac{d}{dx}\left(e^{ax+b}\right) = e^{ax+b} \times \frac{d}{dx}(ax+b)$
9.	$\frac{d}{dx}(\ln\lvert x\rvert) = \frac{1}{x}$	10.	$\frac{d}{dx}[\ln\lvert ax+b\rvert] = \frac{1}{ax+b} \times \frac{d}{dx}(ax+b)$
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.	$\int (ax+b)^n dx = \frac{(ax+b)^{n+1}}{(a)(n+1)} + c \;;\{n \neq -1\}$
3.	$\int k\ dx = kx + c, \quad k \text{ is constant}$	4.	$\int_a^b f(x)dx = F(b) - F(a)$
5.	$\int \frac{1}{x}\ dx = \ln\lvert x\rvert + c$	6.	$\int \frac{1}{ax+b}\ dx = \frac{1}{a} \times \ln\lvert ax+b\rvert + c$
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.	$\int sec^2(ax+b)\ dx = \frac{1}{a} \times \tan(ax+b) + c$		