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 DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI I : 2026/2027

DBM30193: ELECTRICAL ENGINEERING MATHEMATICS

TARIKH : 04 NOVEMBER 2026
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)

TERBUKA

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

CLO 1

(a) The following are the students' Quiz 1 scores for the Mathematics course at Sultan Mizan Zainal Abidin Polytechnic;

Berikut adalah taburan markah Kuiz 1 pelajar bagi kursus Matematik di Politeknik Sultan Mizan Zainal Abidin;

5 , 6 , 8 , 10 , 9 , 8 , 8 , 7 , 8 , 7 , 8 , 7 , 7 , 6 , 5 , 10 , 9 , 8 , 8 , 10

i. calculate the mode of the quiz 1 scores above.

kirakan mod bagi markah kuiz 1 di atas.

[1 mark]

[*1 markah*]

ii. calculate the mean of the Quiz 1 scores.

kirakan min bagi markah Kuiz 1 tersebut.

[4 marks]

[*4 markah*]

iii. calculate the mean deviation of the quiz 1 scores.

kirakan sisihan min bagi markah kuiz 1.

[5 marks]

[*5 markah*]

TERBUKA

CLO 2

(b) In the Final Examination for the Mathematics Course at the Polytechnic, the scores obtained by 256 students are as follows;

Dalam Peperiksaan Akhir bagi Kursus Matematik di Politeknik, markah yang diperolehi oleh 256 orang pelajar adalah seperti berikut;

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

Marks (%) ***Markah (%)***	**No. of Students** ***Bilangan Pelajar***
1-10	10
11-20	20
21-30	30
31-40	40
41-50	50
51-60	40
61-70	30
71-80	20
81-90	10
91-100	6

Refering to the Table 1(b) above, calculate;

Merujuk kepada Jadual 1(b) di atas, kirakan;

i. mean

min

[5 marks]

[*5 markah*]

ii. mode

mod

TERBUKA

[5 marks]

[*5 markah*]

CLO 2

(c) A lecturer purchased a box of plastic balls to be used in a STEM programme. The box contains 10 red balls, 15 blue balls, 25 yellow balls and 30 green balls. Three balls are given to each participant **without replacement.**

Calculate the probability that a student receives a green ball first, a blue ball second and a yellow ball third.

*Seorang pensyarah membeli sekotak bola plastik untuk digunakan dalam program STEM. Di dalam kotak tersebut mengandungi 10 biji bola merah, 15 biji bola biru, 25 biji bola kuning dan 30 biji bola hijau. Tiga biji bola telah diberikan kepada setiap peserta **tanpa penggantian**. Kirakan kebarangkalian untuk pelajar memperolehi bola pertama hijau, bola kedua biru dan bola ketiga kuning.*

[5 marks]

[*5 markah*]

TERBUKA

QUESTION 2

SOALAN 2

CLO2 (a) Based on the following linear equations:

Berdasarkan persamaaan linear yang berikut:

$$e + 2f - 5g = -6$$
$$-3g + 4f + 7 = -4e$$
$$5e + 7f - 13g = -9$$

i. construct the matrix L and matrix U using Crout method.

bina matrik L dan matrik U menggunakan kaedah Crout.

[13 marks]

[*13 markah*]

ii. calculate the elements of e, f and g.

kirakan unsur e, f dan g .

[5 marks]

[*5 markah*]

CLO1 (b) Solve the root equation of $5x^4 + 4x^3 + 3x^2 - 2 = 0$ correct to 3 decimal places by using the Newton Raphson Method. Given $x_0 = 1$.

Selesaikan punca bagi persamaan $5x^4 + 4x^3 + 3x^2 - 2 = 0$ *betul kepada 3 tempat perpuluhan menggunakan Kaedah Newton Raphson. Diberi* $x_0 = 1$.

[7 marks]

[*7 markah*]

TERBUKA

QUESTION 3

SOALAN 3

CLO 2 (a) Solve the following differential equations using the stated method:

Selesaikan persamaan berikut dengan menggunakan kaedah yang dinyatakan:

i. $2x\,\frac{dy}{dx} = 4x - 6x\,sinx$; Direct Integration

; *Pengamiran Langsung*

[5 marks]

[*5 markah*]

ii. $x\,\frac{dy}{dx} = 2xy - y$; Separating Variables

; *Memisahkan Pembolehubah*

[5 marks]

[*5 markah*]

iii. $\frac{dy}{dx} + y = e^x$; Integrating Factors

; *Faktor Pengamiran*

[5 marks]

[*5 markah*]

CLO 1 (b) Solve the following second order differential equations below:

Selesaikan persamaan pembezaan peringkat kedua di bawah:

i. $y'' + 4y' = 5y$

[4 marks]

[*4 markah*]

ii. $y'' + 2y' + 7y = 0$

[6 marks]

[*6 markah*]

TERBUKA

QUESTION 4

SOALAN 4

CLO 1 (a) Calculate the Laplace Transform for the following functions using the stated method:

Kirakan Jelmaan Laplace bagi fungsi berikut dengan menggunakan kaedah yang dinyatakan:

i. $f(t) = e^{2t}sinh5t$; Table of Laplace Transform

; Jadual Jelmaan Laplace

[4 marks]

[*4 markah*]

ii. $f(t) = 3t\,cos4t$; Multiplication with t^n

; Pendaraban dengan t^n

[6 marks]

[*6 markah*]

CLO 2 (b) Solve each of the following functions using the specified method:

Selesaikan setiap fungsi yang berikut dengan menggunakan kaedah yang ditetapkan:

i. $F(s) = \frac{8}{s^3} + \frac{5s}{s^2+16}$; Table of Laplace Transform

; Jadual Jelmaan Laplace

[4 marks]

[*4 markah*]

ii. $F(s) = \frac{2s-2}{s^2+25}$; Table of Laplace Transform

; Jadual Jelmaan Laplace

[5 marks]

[*5 markah*]

TERBUKA

iii. $F(s) = \frac{2s-1}{(s-3)(s-2)}$; Partial Fraction Method

; Kaedah Pecahan Separa

[6 marks]

[*6 markah*]

TERBUKA

SOALAN TAMAT

FORMULA DBM30193 - ELECTRICAL ENGINEERING MATHEMATICS

DESCRIPTIVE STATISTICS		
Mean	$\overline{x} = \frac{\sum x}{n}$	$\overline{x} = \frac{\sum(fx)}{\sum f}$
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	$E = \frac{\sum\lvert x - \overline{x}\rvert}{n}$	$E = \frac{\sum(\lvert x - \bar{x}\rvert f)}{\sum f}$
Variance	$s^2 = \frac{\sum(x - \overline{x})^2}{n}$	$s^2 = \frac{\sum_{i=l}^{n} {x_i}^2 - n\overline{x}^2}{n}$
	$s^2 = \frac{\sum[(x - \overline{x})^2 f]}{\sum f}$	$s^2 = \frac{\sum fx^2}{\sum f} - \left[\frac{\sum fx}{\sum f}\right]^2$
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)

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

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

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. 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.	$\boldsymbol{a}$	$\boldsymbol{\frac{a}{s}}$	13.	$\boldsymbol{e^{-at}}\ sin\ \omega t$	$\boldsymbol{\frac{\omega}{(s+a)^2+\omega^2}}$
2.	$\boldsymbol{at}$	$\boldsymbol{\frac{a}{s^2}}$	14.	$\boldsymbol{e^{-at}}cos\ \omega t$	$\boldsymbol{\frac{s+a}{(s+a)^2+\omega^2}}$
3.	$\boldsymbol{t^n}$	$\boldsymbol{\frac{n!}{s^{n+1}}}$	15.	$\sinh \omega t$	$\boldsymbol{\frac{\omega}{s^2-\omega^2}}$
4.	$\boldsymbol{e^{at}}$	$\boldsymbol{\frac{1}{s-a}}$	16.	$\cosh \omega t$	$\boldsymbol{\frac{s}{s^2-\omega^2}}$
5.	$\boldsymbol{e^{-at}}$	$\boldsymbol{\frac{1}{s+a}}$	17.	$\boldsymbol{e^{at}}\ sinh\ \omega t$	$\boldsymbol{\frac{\omega}{(s-a)^2-\omega^2}}$
6.	$\boldsymbol{te^{-at}}$	$\boldsymbol{\frac{1}{(s+a)^2}}$	18.	$\boldsymbol{e^{-at}}\ sinh\ \omega t$	$\boldsymbol{\frac{\omega}{(s+a)^2-\omega^2}}$
7.	$t^n.e^{at}, n = 1,2,3$	$\frac{n!}{(s-a)^{n+1}}$	19.	$\boldsymbol{e^{-at}}\ cosh\ \omega t$	$\boldsymbol{\frac{s+a}{(s+a)^2-\omega^2}}$
8.	$t^n.f(t)$	$(-1)^n\frac{d^n}{ds^n}[F(s)]$	20.	$\boldsymbol{f_1(t)+f_2(t)}$	$\boldsymbol{F_1(s)+F_2(s)}$
9.	$sin\ \omega t$	$\boldsymbol{\frac{\omega}{s^2+\omega^2}}$	21.	$\boldsymbol{\int_0^t f(u)\,du}$	$\boldsymbol{\frac{F(s)}{s}}$
10.	$cos\ \omega t$	$\boldsymbol{\frac{s}{s^2+\omega^2}}$	22.	$\boldsymbol{f(t-a)u(t-a)}$	$\boldsymbol{e^{-as}F(s)}$
11.	$t\ sin\ \omega t$	$\boldsymbol{\frac{2\omega s}{(s^2+\omega^2)^2}}$	23.	First derivative $\boldsymbol{\frac{dy}{dt}}, y'(t)$	$\boldsymbol{sY(s)-y(0)}$
12.	$t\ cos\ \omega t$	$\boldsymbol{\frac{s^2-\omega^2}{(s^2+\omega^2)^2}}$	24.	Second derivative $\boldsymbol{\frac{d^2y}{dt^2}}, y''(t)$	$\boldsymbol{s^2Y(s)-sy(0)-y'(0)}$

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

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.	$\int k\ dx = kx + c,\ k \text{ is constant}$	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.	$\int sec^2(ax+b)\ dx = \frac{1}{a} \times \tan(ax+b) + c$		