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 II : 2025/2026

DBM30033: ENGINEERING MATHEMATICS 3

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

Kertas soalan 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 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) Write the inequality for the following statetements:

Nyatakan ketaksamaan bagi penyataan–penyataan di bawah:

i. The length (l) of a bridge is less than 2000m.

Jarak (l) adalah kurang daripada 2000m

[1 mark]

[1 *markah*]

ii. The number of workers (w) in a company is more than 400.

Bilangan pekerja (w) di sebuah syarikat adalah lebih daripada 400.

[1 mark]

[1 *markah*]

iii. The weight (m) of the brick is at least 2kg.

Berat (m) sebuah bata adalah sekurang-kurangnya 2kg.

[1 mark]

[1 *markah*]

iv. The velocity (v) of a motorcycle is not exceeding 80km/h.

Kelajuan (v) sebuah motosikal tidak melebihi 80km/h.

[1 mark]

[1 *markah*]

v. The minimum value of $20x + 6y$ is 3.

Nilai minimum bagi $20x + 6y$ *ialah 3.*

[1 mark]

[1 *markah*]

CLO1

(b) A carpenter produces two type of frames which is Frame A and Frame B. The process for both products required a process of cutting and crafting. Frame A takes 6 hours of cutting and 4 hours of crafting. While Frame B takes 4 hours of cutting and 2 hours of crafting. The process will take up to 480 hours for cutting and 280 hours of crafting. Frame A yields a profit of RM150 while Frame B profit is RM200. Calculate the maximum profit for both frame by using a graphical method.

Seorang tukang kayu menghasilkan dua jenis bingkai iaitu bingkai jenis A dan bingkai jenis B. Proses bagi kedua-dua jenis produk ialah proses memotong dan mengukir. Bingkai A mengambil masa 6 jam bagi memotong dan 4 jam bagi mengukir. Manakala Bingkai B mengambil 4 jam bagi memotong dan 2 jam bagi mengukir. Proses memotong mengambil masa sehingga 480 jam dan 280 jam bagi proses mengukir .Keuntungan bagi bingkai A ialah RM150 manakala keuntungan bagi bingkai B ialah RM200. Kirakan keuntungan maksimum bagi kedua-dua bingkai dengan menggunakan kaedah graf.

i) Find the inequality and shade the feasible region that satisfies the condition above.

Cari ketaksamaan dan lorekkan kawasan yang mematuhi keadaan di atas.

[6 marks]

[*6 markah*]

ii) Calculate the highest profit for both frames by using the graphical method.

Kirakan keuntungan maksimum bagi kedua-dua bingkai menggunakan kaedah graf.

[4 marks]

[4 *markah*]

CLO1

(c) Given maximize $P = x + 2y + 3z$ and subject to the constraints,

Diberi maksimum $P = x + 2y + 3z$ *dengan kekangan,*

$$7x + z \leq 6$$
$$x + 2y \leq 20$$

i) Write the objective function and constraints with slack variables.

Tuliskan fungsi objektif dan kekangan dengan bentuk pembolehubah slack.

[3 marks]

[*3 markah*]

ii) Construct the first initial tableau.

Binakan jadual permulaan pertama.

[1 mark]

[1 *markah*]

iii) Show the maximize value by using a Simplex method.

Tunjukkan nilai maksimum menggunakan kaedah Simplex

[6 marks]

[*6 markah*]

SOALAN TAMAT

FORMULA DBM30033 - ENGINEERING MATHEMATICS 3

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	$s = \sqrt{variance}$	

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

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	$x_{n+1} = x_n - \dfrac{f(x_n)}{f'(x_n)}$	
False Position Method	$x_0 = \dfrac{1}{y_2 - y_1} \begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \end{vmatrix}$	

SOLUTION FOR 1st ORDER DIFFERENTIAL EQUATION	
Logarithmic $a = e^{\ln a}$ $a^x = e^{x \ln a}$ $\int a^x \, dx = \dfrac{a^x}{\ln a} + c$	**Homogeneous Equation** $y = vx$ and $\dfrac{dy}{dx} = v + x\dfrac{dv}{dx}$ **Linear Factors (Integrating Factors)** $\dfrac{dy}{dx} + Py = Q$ $y \cdot IF = \int Q \cdot IF \, dx$ Where $IF = e^{\int P \, dx}$
GENERAL SOLUTION FOR 2nd ORDER DIFFERENTIAL EQUATION	
Equation of the form	$a\dfrac{d^2y}{dx^2} + b\dfrac{dy}{dx} + cy = 0$
Quadratics Formula	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
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	$y = e^{\alpha x}(A\cos\beta x + B\sin\beta x)$

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.	$\frac{d}{dx}(\ln\|x\|) = \frac{1}{x}$	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.	$\int (ax+b)^n dx = \frac{(ax+b)^{n+1}}{(a)(n+1)} + c \;;\{n \neq -1\}$
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.	$\int sec^2(ax+b)\ dx = \frac{1}{a} \times \ \tan(ax+b) + c$		