

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 I : 2025/2026

DBM30033 : ENGINEERING MATHEMATICS 3

TARIKH : 24 NOVEMBER 2025

MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

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

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Kertas Graf dan Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTION:

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

ARAHAN:

Bahagian ini mengandungi EMPAT (4) soalan subjektif. Jawab semua soalan.

QUESTION 1**SOALAN 1**

CLO1

- (a) Table 1(a) shows the distribution of loads which were supported by cables produced by a company.

Jadual 1(a) menunjukkan agihan bebanan yang disokong oleh kabel dikeluarkan oleh sebuah syarikat.

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

Load (kilo Newtons) / <i>Bebanan</i>	Frequency / <i>Frekuensi</i>
80 - 84	3
85 - 89	12
90 - 94	14
95 - 99	9
100 - 104	7
105 - 109	5

Calculate:

Kirakan:

- i. Mode

Mod

[3 marks]

[3 markah]

- ii. Variance

Varian

[7 marks]

[7 markah]

- CLO1 (b) The following data shows the frequency of 8 people who used their debit cards for the past 4 months.
Data berikut menunjukkan kekerapan bagi 8 orang yang menggunakan kad debit mereka sepanjang 4 bulan yang lalu.
- 6 28 7 2 18 7 3 6
- Calculate:
Kirakan
- i. Median
Median
- [3 marks]
 [3 markah]
- ii. Mean deviation
Sisihan min
- [5 marks]
 [5 markah]
- CLO1 (c) Two balls are drawn successively without replacement from a box which contains 4 white balls and 3 red balls. Calculate the probability that:
Dua biji bola diambil secara turutan tanpa gantian daripada sebuah kotak yang mengandungi 4 biji bola berwarna putih dan 3 biji bola berwarna merah. Kirakan kebarangkalian bahawa:
- i. The first ball drawn is white and the second is red
Bola pertama yang diambil ialah putih dan yang kedua ialah merah
- [3 marks]
 [3 markah]
- ii. The second event is dependent on the first event
Peristiwa kedua bersandar dengan yang peristiwa pertama
- [4 marks]
 [4 markah]

QUESTION 2**SOALAN 2**

CLO1

- (a) Given the linear equations are as follow:

$$2x - 2y + 3z = 2$$

$$x + 2y - z = 3$$

$$3x - y + 2z = 1$$

- i. Solve the equations below using the Gaussian Elimination Method.

Selesaikan persamaan-persamaan berikut dengan menggunakan kaedah Penghapusan Gauss.

[8 marks]

[8 markah]

- ii. Based on equations (a), calculate value of
- x
- ,
- y
- and
- z
- by using Crout Method if matrix
- L
- and
- U
- are as below:

Berdasarkan persamaan-persamaan (a), kirakan nilai x , y dan z dengan menggunakan kaedah Crout jika matrik L dan U adalah seperti di bawah:

$$L = \begin{pmatrix} 2 & 0 & 0 \\ 1 & 3 & 0 \\ 3 & 2 & -\frac{5}{6} \end{pmatrix} \quad \text{and} \quad U = \begin{pmatrix} 1 & -1 & \frac{3}{2} \\ 0 & 1 & -\frac{5}{6} \\ 0 & 0 & 1 \end{pmatrix}$$

[10 marks]

[10 markah]

CLO1

- (b) Calculate the root of a curve
- $y = x^3 - 2x - 1$
- by using the Newton Raphson Method and give your answer correct to 1 decimal places. Given that
- $x_0 = 3$
- .
-
- Kirakan punca bagi lengkung $y = x^3 - 2x - 1$ dengan menggunakan Kaedah Newton Raphson dan berikan jawapan anda tepat kepada 1 tempat perpuluhan. Diberi $x_0 = 3$.*

[7 marks]

[7 markah]

QUESTION 3**SOALAN 3**

CLO1

- (a) Categorize the order and degree of the following equations:

Kategorikan peringkat dan darjah bagi persamaan-persamaan berikut:

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

[2 marks]

[2 markah]

ii.
$$\left(\frac{d^2y}{dx^2}\right)^3 + 3\left(\frac{dy}{dx}\right)^4 + 5\left(\frac{dy}{dx}\right) = 7$$

[2 marks]

[2 markah]

CLO1

- (b) Solve the following differential equations by using the methods stated:

Selesaikan persamaan berikut menggunakan kaedah yang dinyatakan:

i.
$$\frac{dy}{dx} = 2x^3 - \frac{1}{x+3} + e^{2x}$$
 ; Direct Integration

; Pengamiran Langsung

[5 marks]

[5 markah]

ii.
$$\frac{dy}{dx} + 2y = 5e^{-3x}$$
 ; Integrating Factor

; Faktor Pengamiran

[6 marks]

[6 markah]

CLO1

- (c) Solve the following second order differential equations:

Selesaikan persamaan peringkat kedua yang berikut:

i.
$$7\frac{d^2y}{dx^2} - 3\frac{dy}{dx} = 10y$$

[5 marks]

[5 markah]

ii.
$$3\frac{d^2y}{dx^2} + 10y = 4\frac{dy}{dx}$$

[5 marks]

[5 markah]

QUESTION 4**SOALAN 4**

CLO1

- (a) A store wants to sell 200 shirts and 100 pairs of pants. They have decided to put together two offers, A and B. Package A is a package of one shirt and a pair of pants which will sell for RM30. Package B is a package of three shirts and a pair of pants, which will sell for RM50. The store does not want to sell less than 20 packages A and less than 10 of package B. Express the objective function and constrain of this problem.

Sebuah kedai ingin menjual 200 helai baju dan 100 pasang seluar. Mereka telah memutuskan untuk mengumpulkan dua pakej A dan B. Pakej A ialah pakej sehelai baju dan sepasang seluar yang akan dijual pada harga RM30. Pakej B ialah pakej tiga helai baju dan sepasang seluar, yang akan dijual pada harga RM50. Peniaga tidak mahu menjual kurang daripada 20 pakej A dan kurang daripada 10 daripada pakej B. Nyatakan fungsi objektif dan kekangan masalah ini.

[5 marks]

[5 markah]

CLO1

- (b) Function maximization $Z = 3x_1 + 2x_2$ with constrains:
Fungsi maksimum $Z = 3x_1 + 2x_2$ dengan kekangan:

$$x_1 \leq 12$$

$$x_1 + 3x_2 \leq 45$$

$$2x_1 + x_2 \leq 30$$

$$x_1 \geq 0, \quad x_2 \geq 0$$

- i. Solve the problem by using graphical method.

Selesaikan permasalahan dengan menggunakan kaedah graf.

[5 marks]

[5 markah]

- ii. Calculate the solution of maximization Z for this model.
Kirakan penyelesaian bagi Z maksimum model ini.
- [5 marks]
[5 markah]
- CLO1 (c) Function maximization $Z = 5x_1 + 4x_2$ with constraints:
Fungsi maksimum $Z = 5x_1 + 4x_2$ dengan kekangan:
- $$2x_1 + x_2 \leq 100$$
- $$4x_1 + 2x_2 \leq 80$$
- $$3x_1 + 3x_2 \leq 60$$
- i. Change the above constraints to Standard Simplex Form.
Tukarkan kekangan di atas kepada Bentuk Simplex Piawai.
- [4 marks]
[4 markah]
- ii. Write the Standard Form to Initial Simplex Tableau.
Tuliskan Bentuk Piawai kepada Jadual Simplex Permulaan.
- [1 mark]
[1 markah]
- iii. Show the value of the maximize, $Z = 5x_1 + 4x_2$ using Simplex Method.
Tunjukkan nilai maksimum, $Z = 5x_1 + 4x_2$ dengan menggunakan Kaedah Simplex.
- [5 marks]
[5 markah]

SOALAN TAMAT

FORMULA DBM30033 - ENGINEERING MATHEMATICS 3

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	$s = \sqrt{\text{variance}}$	

NUMERICAL METHOD		
Crout Method	$A = \begin{pmatrix} l_{11} & 0 & 0 \\ l_{21} & l_{22} & 0 \\ l_{31} & l_{32} & l_{33} \end{pmatrix} \begin{pmatrix} 1 & u_{12} & u_{13} \\ 0 & 1 & u_{23} \\ 0 & 0 & 1 \end{pmatrix}$	$\begin{aligned} Ly &= b \\ Ux &= y \end{aligned}$

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

SOLUTION FOR 1 st ORDER DIFFERENTIAL EQUATION	
Logarithmic $a = e^{\ln a}$ $a^x = e^a$ $\int a^x dx = \frac{a^x}{\ln a} + C$ $\frac{a^x}{\ln a} + C$	Homogeneous Equation $y = vx$ $v = \frac{y}{x}$ and $\frac{dy}{dx} = v + x \frac{dv}{dx}$
	Linear Factors (Integrating Factors) $\frac{dy}{dx} + Py = Q$ $y \bullet IF = \int Q \bullet IF dx$ $y = IF$ Where $I.F = e^{\int P dx}$ $IF = e^{\int P dx}$
GENERAL SOLUTION FOR 2 nd ORDER DIFFERENTIAL EQUATION	
Equation of the form $a \frac{d^2 y}{dx^2} + b \frac{dy}{dx} + cy = 0$	$a \frac{d^2 y}{dx^2} + b \frac{dy}{dx} + cy = 0$
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	$y = e^{mx}(A + Bx)$
3. Complex roots	$y = e^{\alpha x}(A \cos \beta x + B \sin \beta x)$

DIFFERENTIATION			
1.	$\frac{d}{dx}(k) = 0, k \text{ is constant}$	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.	$\frac{d}{dx}(x) = \frac{1}{x}$	10.	$\frac{d}{dx}[\ln(ax + b)] = \frac{1}{ax+b} \times \frac{d}{dx}(ax + b)$
11.	$\frac{d}{dx}(\sin \sin x) = \cos \cos x$	12.	$\frac{d}{dx}(\cos \cos x) = -\sin \sin x$
13.	$\frac{d}{dx}(\tan \tan x) = x$	14.	$\frac{d}{dx}[\sin \sin(ax + b)] = \cos \cos(ax + b) \times \frac{d}{dx}(ax + b)$
15.	$\frac{d}{dx}[\cos \cos(ax + b)] = -\sin \sin(ax + b) \times \frac{d}{dx}(ax + b)$	16.	$\frac{d}{dx}[\tan \tan(ax + b)] = (ax + b) \times \frac{d}{dx}(ax + b)$
17.	$\frac{d}{dx}[u] = nu \times \frac{du}{dx}$	18.	$\frac{d}{dx}[u] = nu \times \frac{du}{dx}$
19.	$\frac{d}{dx}[u] = nu \times \frac{du}{dx}$		

INTEGRATION			
1.	$\int ax^n dx = \frac{ax^{n+1}}{n+1} + c ; \{n \neq -1\}$	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.	$\int \frac{1}{ax+b} dx = \ln ax + b + c$
7.	$\int e^x dx = e^x + c$	8.	$\int e^{ax+b} dx = \frac{1}{a} \times e^{ax+b} + c$
9.	$\int \sin \sin x dx = -\cos \cos x + c$	10.	$\int \cos \cos x dx = \sin \sin x + c$
11.	$\int x dx = \tan \tan x + c$		
12.	$\int \sin \sin(ax + b) dx = -\cos \cos(ax + b) + c$		
13.	$\int \cos \cos(ax + b) dx = \sin \sin(ax + b) + c$		
14.	$\int (ax + b) dx = \frac{1}{a} \times \tan \tan(ax + b) + c$		