

SULIT



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

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI I : 2022/2023

DBM30033 : ENGINEERING MATHEMATICS 3

TARIKH : 21 DISEMBER 2022

MASA : 8.30 AM – 10.30 AM (2 JAM)

Kertas ini mengandungi **LAPAN (8)** halaman bercetak.
Struktur (4 soalan)
Dokumen sokongan yang disertakan : Formula & Kertas Graf

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 berstruktur. Jawab semua soalan.

QUESTION 1**SOALAN 1**

CLO1
C3

- (a) Table 1(a) shows the total time spent for playing video games by 50 students of DAD3 for a period of 2 weeks.

Jadual 1(a) menunjukkan jumlah masa yang dihabiskan untuk bermain permainan video oleh 50 pelajar DAD3 untuk tempoh 2 minggu.

Table 1(a)/Jadual 1(a)

Total time(hours)/ <i>Masa(jam)</i>	0 - 5	6 - 11	12 - 17	18 - 23	24 - 29	30 - 35	36 - 41
Number of student/ <i>Bilangan pelajar</i>	7	7	9	9	8	6	4

Based on the table, calculate:

Berdasarkan jadual, kirakan:

- i. Mean

Min

[4 marks]

[4 markah]

- ii. Standard Deviation

Sisihan Piawai

[6 marks]

[6 markah]

CLO1
C3

- (b) Given a set of data 4, 7, 8, 9 and 10. Calculate the mean and median of the data if:
Diberi satu set data 4, 7, 8, 9 dan 10. Kirakan min dan median untuk data jika:

- i. Add 2 to each of the original data
Tambahkan 2 pada setiap data

[4 marks]

[4 markah]

- ii. Multiply each of the original data with 2
Darabkan dengan 2 bagi setiap data

[4 marks]

[4 markah]

CLO1
C3

- (c) In a class of 30 students, 15 students like basketball, 14 students like football and 9 students like both basketball and football. Calculate the probability of a chosen person at random who likes:

Dalam sebuah kelas 30 orang pelajar, 15 pelajar sukakan bola keranjang, 14 orang pelajar sukakan bola sepak dan 9 orang pelajar suka kedua-keduanya. Kirakan kebarangkalian seorang yang dipilih secara rawak akan sukakan:

- i. at least one of the games.
sekurang-kurangnya satu daripada permainan-permainan itu.

[4 marks]

[4 markah]

- ii. basketball given that they like football
bola keranjang diberi mereka sukakan bola sepak.

[3 marks]

[3 markah]

QUESTION 2**SOALAN 2**CLO1
C3

- (a) Solve the linear equations below by using Gaussian elimination method.
Selesaikan persamaan linear di bawah menggunakan kaedah Penghapusan Gauss.

$$2x_1 - 2x_2 + 3x_3 = 3$$

$$4x_2 - 3x_3 = 3$$

$$3x_1 - 3x_2 + x_3 = -5$$

[7 marks]

[7 markah]

CLO1
C3

- (b) Based on the following equations, determine matrix L and matrix U by using Doolittle Method.

Berdasarkan persamaan berikut, tentukan matrik L dan matrik U dengan menggunakan kaedah Doolittle.

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

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

$$x - y - z = 4$$

[8 marks]

[8 markah]

CLO1
C3

- (c) Determine the real root for $f(x) = x^2 + 4x - 7$ by using Newton Raphson Method which lies between $x = 1$ and $x = 2$. Give the correct answer to 3 decimal places.

Tentukan punca persamaan bagi $f(x) = x^2 + 4x - 7$ dengan menggunakan Kaedah Newton Raphson yang terletak di antara $x = 1$ dan $x = 2$. Beri jawapan tepat kepada 3 titik perpuluhan.

[10 marks]

[10 markah]

QUESTION 3**SOALAN 3**CLO1
C2

- (a) Express the differential equation for $y = 3Ax^2 + 2B$
Ungkapkan persamaan pembezaan bagi $y = 3Ax^2 + 2B$

[5 Marks]

[5 Markah]

CLO1
C3

- (b) Solve the differential equation for the following:
Selesaikan persamaan pembezaan bagi yang berikut:

i. $\frac{dy}{dx} = \frac{y}{x} + \frac{3x}{y}$ (using homogeneous)

[7 Marks]

[7 Markah]

ii. $\frac{dy}{dx} = \frac{2x^2 - x}{x}$ (using direct integration)

[3 Marks]

[3 Markah]

CLO1
C3

- (c) Determine the general solution for the differential equations below:
Tentukan penyelesaian umum bagi persamaan pembezaan berikut:

i. $2 \frac{d^2y}{dx^2} - 5 \frac{dy}{dx} - 3y = 0$

[4 Marks]

[4 Markah]

ii. $\frac{d^2y}{dx^2} = 4 \frac{dy}{dx} - 13y$

[6 Marks]

[6 Markah]

QUESTION 4**SOALAN 4**CLO1
C2

(a) Express the inequality for the following cases:

*Ungkapkan ketaksamaan bagi kes-kes berikut:*i. The total sum of x and y is not more than 120*Jumlah x dan y adalah tidak melebihi 120.*

[1 mark]

[1 markah]

ii. The minimum value of z is 23.*Nilai minimum z adalah 23.*

[1 mark]

[1 markah]

iii. The speed limit (v) of a jet fighter is exceeding 4.4 mach.*Had kelajuan jet pejuang melebihi 4.4 mach.*

[1 mark]

[1 markah]

iv. The value of y is between 60 and less than 70*Nilai y terletak di antara 60 dan kurang dari 70*

[1 mark]

[1 markah]

v. The minimum pass mark for DBM30033, m is 40.*Markah lulus minimum DBM30033, m adalah 40.*

[1 mark]

[1 markah]

CLO1
C3

- (b) A bakery shop is planning on having a sale on a Festive Day. They have 20kg flour, 150 eggs and 8kg sugar. The baker plan to prepare two types of confections; muffins (x) and cupcakes (y). To prepare each muffin, they need 0.05kg flour, 0.25 egg and 0.01kg sugar. And to prepare each cupcake, they need 0.04kg flour, 0.50 of egg and 0.02kg sugar. The price of each muffin and cupcake is RM2.50 and RM1.80 respectively.

Kedai bakeri bercadang untuk mengadakan jualan sempena perayaan. Mereka mempunyai 20kg tepung, 150 biji telur dan 8kg gula. Pemilik kedai ingin menyediakan dua jenis juadah iaitu muffin (x) dan kek cawan (y). Untuk menyediakan sebiji muffin, mereka memerlukan 0.05kg tepung, suku biji telur, dan 0.01 kg gula. Manakala untuk sebiji kek cawan, mereka memerlukan 0.04kg tepung, setengah biji telur dan 0.02kg gula. Harga sebiji muffin dan sebiji kek cawan adalah RM2.50 dan RM1.80.

- i. Write **THREE (3)** inequalities to represent the information given.

*Tuliskan **TIGA (3)** ketaksamaan yang mewakili maklumat yang telah diberikan.*

[3 marks]

[3 markah]

- ii. Express the objective function for this situation

Nyatakan fungsi objektif bagi situasi ini.

[1 mark]

[1 markah]

- iii. Draw and shade the feasible region which satisfies the given condition. Hence, calculate the maximum profit will be obtained by the bakery shop on that day.

Lukis dan lorekkan kawasan yang boleh dilaksanakan yang memenuhi syarat yang diberikan. Kemudian, kirakan keuntungan maksimum yang akan diperolehi oleh kedai bakeri pada hari tersebut.

[6 marks]

[6 markah]

CLO1
C3

- (c) Given Linear Programming problem with, Maximum $P = 3x + y + 2z$ with constraint

Diberi permasalahan Pengaturcaraan Linear dengan, Maksimum $P = 3x + y + 2z$ dengan kekangan

$$3x + 3y \leq 4$$

$$2x + 4z \leq 3$$

$$3x + 2y + z \leq 5$$

$$x, y, z \geq 0$$

- i. Write the problem in Standard Simplex Form

Tuliskan pernyataan masalah dalam Bentuk Simplex Piawai.

[4 marks]

[4 markah]

- ii. Convert the following Standard Form into First Initial Tableau.

Tukarkan Bentuk Piawai berikut ke dalam Jadual Permulaan Tableau.

[6 marks]

[6 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	$Mode = L_{Mo} + \left(\frac{d_1}{d_1 + d_2} \right) C$	
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	$s^2 = \frac{\sum (x - \bar{x})^2}{n}$	$s^2 = \frac{\sum x_i^2 - n\bar{x}^2}{n}$
	$s^2 = \frac{\sum [(x - \bar{x})^2 f]}{\sum f}$	$s^2 = \frac{\sum fx^2}{\sum f} - \left[\frac{\sum fx}{\sum f} \right]^2$
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	$y = e^{mx} (A + Bx)$
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.	$\frac{d}{dx}(ax^n) = anx^{n-1} \quad [\text{Power Rule}]$
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.	$\int \sec^2(ax+b) dx = \frac{1}{a} \times \tan(ax+b) + c$		