

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN MATEMATIK, SAINS & KOMPUTER

**PEPERIKSAAN AKHIR
SESI DISEMBER 2017**

DBM3013 : ENGINEERING MATHEMATICS 3

**TARIKH : 31 MAC 2018
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)**

Kertas ini mengandungi **DUA BELAS (12)** halaman bercetak.

Bahagian A: Struktur (4 soalan)
Bahagian B: Struktur (2 soalan)

Dokumen sokongan yang disertakan : Kertas Graf dan Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A: 75 MARKS

BAHAGIAN A: 75 MARKAH

INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answer **THREE (3)** questions only.

ARAHAN:

Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **TIGA (3)** soalan sahaja.

QUESTION 1

SOALAN 1

CLO2
C2

(a) Table 1(a) shows the percentage of the expenditure incurred in publishing a book.

Jadual 1(a) menunjukkan peratus perbelanjaan yang diperlukan dalam penghasilan sebuah buku.

Items <i>Item</i>	Percentage of expenses <i>Peratus Perbelanjaan</i>
Printing <i>Percetakan</i>	25%
Transportation <i>Pengangkutan</i>	15%
Paper <i>Kertas</i>	30%
Binding <i>Penjilidan</i>	20%
Promotion <i>Promosi</i>	10%

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

i. Calculate the cost value in RM for each item if the total expenditure is RM200.

Kirakan nilai kos dalam RM untuk setiap item jika jumlah perbelanjaan adalah RM200.

[5 marks]

[5 markah]

ii. Based on Table 1(a), draw a pie chart to represent the data given.

Berdasarkan Jadual 1(a), lukiskan carta pai untuk mewakili data yang diberikan.

[5 marks]

[5 markah]

CLO2
C3

(b) Table 1(b) shows the typing speed for 120 secretarial students.

Jadual 1(b) menunjukkan kelajuan menaip bagi 120 orang pelajar kesetiausahaan.

Time (Minute) <i>Masa (Minit)</i>	Number of Students <i>Bilangan Pelajar</i>
1 - 10	30
11 - 20	15
21 - 30	43
31 - 40	20
41 - 50	10
51 - 60	2

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

Based on Table 1(b), calculate

Berdasarkan Jadual 1(b), kirakan

i. Mean / *Min*

[4 marks]

[4 markah]

ii. Median / *Median*

[5 marks]

[5 markah]

iii. Variance / *Varians*

[4 marks]

[4 markah]

iv. Standard deviation / *Sisihan piawai*

[2 marks]

[2 markah]

QUESTION 2

SOALAN 2

CLO2
C2

- (a) A used car company started a business with 60 Proton and Honda cars. 25 of the cars are Proton. If two cars is sold and without replacement, determine the probability that:

Sebuah syarikat kereta terpakai memulakan perniagaan dengan 60 buah kereta Proton dan Honda. 25 buah daripadanya adalah kereta Proton. Jika dua buah kereta dijual dan tanpa penggantian, tentukan kebarangkalian bahawa:

- i. Both cars are Honda.

Kedua-dua kereta adalah kereta Honda.

[4 marks]

[4 markah]

- ii. Both cars are Proton.

Kedua-dua kereta adalah kereta Proton.

[2 marks]

[2 markah]

- iii. Both cars are different.

Kedua-dua kereta adalah berbeza.

[4 marks]

[4 markah]

CLO2
C3

- (b) There are 40 students from Sukma College; 25 students learn archery and 23 students learn swimming. Calculate the probability that

Terdapat 40 orang pelajar dari Kolej Sukma; 25 pelajar belajar memanah dan 23 pelajar belajar berenang. Kira kebarangkalian bahawa

- i. A student learning archery or swimming.

Pelajar yang belajar memanah atau berenang.

[3 marks]

[3 markah]

- ii. A student learning archery and swimming.

Pelajar yang belajar memanah dan berenang.

[6 marks]

[6 markah]

- iii. A student learning archery only.

Pelajar yang belajar memanah sahaja.

[3 marks]

[3 markah]

- iv. A student learning swimming only.

Pelajar yang belajar berenang sahaja.

[3 marks]

[3 markah]

QUESTION 3

SOALAN 3

CLO2
C2

(a)

- i. Express the statements below in the form of inequality.

Nyatakan pernyataan-pernyataan di bawah dalam bentuk ketaksamaan.

- a. The sum of x and y is less than 25.

Jumlah bilangan x dan y adalah kurang daripada 25.

[1 mark]

[1 markah]

- b. The minimum value of y is 11.

Nilai minimum bagi y adalah 11.

[1 mark]

[1 markah]

- c. The value of x is at most 300.

Nilai x tidak melebihi 300.

[1 mark]

[1 markah]

- ii. Excell Language Institute is offering Mandarin Language and Spanish Language courses during summer semester break. The monthly fee for Mandarin Language and Spanish Language courses is RM250 and RM350 respectively. The number of participant for Mandarin Language Course must not exceed 40 people and there must be at least 20 participants of Spanish Language Course. The total number of participants for these two courses must not exceed 120 people. Total fees collected for each month must be at least RM10,000.

Institut Bahasa Excell menawarkan kursus Bahasa Mandarin dan kursus Bahasa Sepanyol semasa cuti semester musim panas. Yuran bulanan bagi kursus Bahasa Mandarin dan kursus Bahasa Sepanyol masing-masing adalah RM250 dan RM350. Bilangan peserta kursus Bahasa Mandarin tidak boleh melebihi 40 orang dan sekurang-kurangnya mesti ada 20 orang peserta kursus Bahasa Sepanyol. Jumlah keseluruhan peserta bagi kedua-dua kursus mestilah tidak melebihi 120 orang. Jumlah yuran yang dikutip setiap bulan mestilah sekurang-kurangnya RM10,000.

- a. State the variables for the above case.

Nyatakan pembolehubah-pembolehubah bagi kes di atas.

[2 marks]

[2 markah]

- b. Express four inequalities other than $x \geq 0$ and $y \geq 0$ that fulfilled the condition above.

Senaraikan empat ketaksamaan yang memenuhi syarat di atas selain daripada $x \geq 0$ dan $y \geq 0$.

[5 marks]

[5 markah]

CLO2
C3

- (b) On weekend, Wahid sells fruits in a market near his house. He has RM225 and plans to buy x kg of banana and y kg of papaya. The mass of the banana is at most three times than the mass of the papaya. The total mass of the fruits is not less than 15 kg. The price of 1 kg of banana is RM7 and the price of 1 kg of papaya is RM5.

Setiap hujung minggu, Wahid menjual buah-buahan di sebuah pasar berdekatan rumahnya. Dia mempunyai wang sebanyak RM225 dan bercadang untuk membeli x kg pisang dan y kg betik. Berat bagi pisang paling banyak adalah tiga kali ganda berat betik. Jumlah berat kesemua buah-buahan adalah tidak kurang daripada 15 kg. Harga 1 kg pisang ialah RM7 dan harga 1 kg betik ialah RM5.

- i. List three inequalities, other than $x \geq 0$ and $y \geq 0$ that satisfy all the above condition.

Senaraikan tiga ketaksamaan yang memenuhi syarat di atas selain daripada $x \geq 0$ dan $y \geq 0$.

[3 marks]

[3 markah]

- ii. State the objective function if Wahid get profit from banana is RM3 and papaya is RM2 so that he can gain maximum profit.

Nyatakan fungsi objektif jika Wahid mendapat keuntungan daripada pisang adalah RM3 dan betik adalah RM2 supaya beliau mendapat keuntungan yang maksimum.

[1 mark]

[1 markah]

- iii. Using a scale of 2 cm to 5 kilogram on the axis, draw and shade the feasible region which satisfied the given condition. Based on the graph, find the maximum profit that can be gained by Wahid.

Menggunakan skala 2 cm bersamaan 5 kilogram pada kedua-dua paksi, lukis dan lorekkan rantau yang memenuhi syarat-syarat yang diberi. Berdasarkan graf, cari keuntungan maksimum yang boleh diperolehi oleh Wahid.

[11 marks]

[11 markah]

QUESTION 4

SOALAN 4

CLO2
C2

- (a) Given the following Linear Programming problem. State the problem in Standard Simplex Form.

Diberi masalah Pengaturcaraan Linear berikut. Nyatakan masalah tersebut dalam Bentuk Simpleks Piawai.

- i. Maximum value

Nilai maksima

$$Z = 15x + 40y$$

With the constraints

Dengan kekangan-kekangan

$$-0.2x + 0.8y \leq 0$$

$$2x + 4y \leq 240$$

$$x \leq 100$$

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

[5 marks]

[5 markah]

- ii. Maximum value

Nilai maksima

$$Z = x_1 + 5x_2$$

With the constraints

Dengan kekangan-kekangan

$$x_1 + x_2 \leq 10$$

$$x_1 + 2x_2 \leq 6$$

$$-2x_1 + x_2 \leq 2$$

$$x_1 \geq 0, x_2 \geq 0.$$

[5 marks]

[5 markah]

CLO2
C3

b) Solve the Linear Programming problem by using the Simplex Method.

Selesaikan masalah Pengaturcaraan Linear berikut dengan menggunakan Kaedah Simpleks.

$$Z = x_1 + 2x_2$$

With the constraints

Dengan kekangan-kekangan

$$x_1 + 3x_2 \leq 15$$

$$2x_1 - x_2 \leq 12$$

$$x_1, x_2 \geq 0$$

[15 marks]

[15 markah]

SECTION B: 25 MARKS

BAHAGIAN B: 25 MARKAH

INSTRUCTION:

This section consists of TWO (2) structured questions. Answer ONE (1) question only.

ARAHAN:

Bahagian ini mengandungi DUA (2) soalan berstruktur. Jawab SATU (1) soalan sahaja.

QUESTION 5

SOALAN 5

CLO1
C2

(a)

- i. Identify three methods to find the roots of linear equations.

Kenalpasti tiga kaedah untuk mencari punca persamaan linear.

[3 marks]

[3 markah]

- ii. Determine the root of the function $y = x^3 + 4x^2 + 7$ correct to three decimal places using Newton Raphson Method. Given $x_0 = -4$.

Tentukan nilai punca bagi persamaan fungsi $y = x^3 + 4x^2 + 7$ tepat kepada tiga tempat perpuluhan menggunakan Kaedah Newton Raphson. Diberi $x_0 = -4$.

[7 marks]

[7 markah]

CLO1
C3

- (b) Solve the linear system equation using Doolittle Method.

Selesaikan sistem persamaan linear berikut menggunakan Kaedah Doolittle.

$$4x + y + 2z = 1$$

$$3y + z = 2$$

$$5x + y - 3z = 5$$

[15 marks]

[15 markah]

QUESTION 6

SOALAN 6

CLO1
C2

(a) Determine a differential equation for each of the following functions

Tentukan persamaan pembezaan bagi setiap fungsi yang berikut:

i. $y = Ae^{x^3}$

[2 marks]

[2 markah]

ii. $3y^2 \frac{dy}{dx} = 4x^3$

[4 marks]

[4 markah]

iii. $e^{2x} \frac{dy}{dx} = 3y^2$

[4 marks]

[4 markah]

CLO1
C3

(b) Solve the following differential equations below:

Selesaikan persamaan pembezaan berikut:

i. $\frac{d^2y}{dx^2} + 7\frac{dy}{dx} + 10y = 0$

[4 marks]

[4 markah]

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

[4 marks]

[4 markah]

iii. $2\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 3y = 0$

[7 marks]

[7 markah]

SOALAN TAMAT

FORMULA DBM3013- ENGINEERING MATHEMATICS 3

DESCRIPTIVE STATISTICS		
Number of class	$k = 1 + 3.33 \log n$	
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 = $L_{Mo} + \left[\frac{d_1}{d_1 + d_2} \right] C$	
Quartile	$Q_k = L_{Q_k} + \left[\frac{\frac{kN}{4} - F}{f_{Q_k}} \right] C$; k = 1, 2, 3	
Decile	$D_k = L_{D_k} + \left[\frac{\frac{kN}{10} - F}{f_{D_k}} \right] C$; k = 1, 2, 3..... 9	
Percentile	$P_k = L_{P_k} + \left[\frac{\frac{kN}{100} - F}{f_{P_k}} \right] C$; k = 1, 2, 3 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	$A = \begin{pmatrix} l_{11} & 0 & 0 \\ l_{21} & l_{22} & 0 \\ l_{31} & l_{32} & l_{33} \end{pmatrix} \begin{pmatrix} 1 & u_{12} & u_{13} \\ 0 & 1 & u_{23} \\ 0 & 0 & 1 \end{pmatrix}$	
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	$x_0 = \frac{1}{y_2 - y_1} \begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \end{vmatrix}$	$x_{n+1} = x_n - \frac{f(x)}{f'(x)}$

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

SOLUTION FOR 1 st ORDER DIFFERENTIAL EQUATION	
Homogeneous Equation $y = vx$ and $\frac{dy}{dx} = v + x \frac{dv}{dx}$	Linear Factors (Integrating Factors) $y \cdot IF = \int Q \cdot IF dx$ Where $IF = e^{\int P dx}$
	Logarithmic $a = e^{\ln a}$ $a^x = e^{x \ln a}$ $\int a^x dx = \frac{a^x}{\ln a} + c$
GENERAL SOLUTION FOR 2 nd ORDER DIFFERENTIAL EQUATION	
Equation of the form $a \frac{d^2 y}{dx^2} + b \frac{dy}{dx} + cy = 0$	
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.	$\frac{d}{dx}(x^n) = nx^{n-1}$ [Power Rule]
3.	$\frac{d}{dx}(ax^n) = anx^{n-1}$	4.	$\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$
5.	$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx}$ [Product Rule]	6.	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$ [Quotient Rule]
7.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du}$ [Chain Rule]	8.	$\frac{d}{dx}(e^x) = e^x$
9.	$\frac{d}{dx}(e^{ax+b}) = e^{ax+b} \times \frac{d}{dx}(ax+b)$	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.	$\int ax^n dx = \frac{ax^{n+1}}{n+1} + c ; \{n \neq -1\}$	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.	$\int \sin(ax+b) dx = -\frac{1}{\frac{d}{dx}(ax+b)} \times \cos(ax+b) + c$		
13.	$\int \cos(ax+b) dx = \frac{1}{\frac{d}{dx}(ax+b)} \times \sin(ax+b) + c$		
14.	$\int \sec^2(ax+b) dx = \frac{1}{\frac{d}{dx}(ax+b)} \times \tan(ax+b) + c$		