

SULIT



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

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2016

DBM3013: ENGINEERING MATHEMATICS 3

TARIKH : 27 OKTOBER 2016

MASA : 8.30 AM - 10.30 AM (2 JAM)

Kertas ini mengandungi **LIMA BELAS (15)** halaman bercetak.
Bahagian A: Struktur (4 soalan)
Bahagian B: Struktur (2 soalan)
Bahagian C: Pilih **SATU (1)** soalan sahaja dari bahagian A atau B
yang belum dijawab.

Dokumen sokongan yang disertakan : Kertas Graf, Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A: 50 MARKS

BAHAGIAN A: 50 MARKAH

INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answer **TWO (2)** questions only.

ARAHAN:

Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **DUA (2)** soalan sahaja.

QUESTION 1

SOALAN 1

- CLO2
C2
- a) A survey is conducted in a supermarket on a sample of 150 customers who have purchased a brand of perfume reveals the following age distribution as Table 1 (a).
Sebuah kaji selidik dijalankan di sebuah pasaraya, melibatkan sampel seramai 150 orang pelanggan yang membeli jenama minyak wangi menunjukkan taburan umur seperti dalam jadual 1 (a).

Age (years)	Number of customer
15-19	9
20-24	16
25-29	27
30-34	44
35-39	42
40-44	10
45-49	2
Total	150

Table 1 (a): Age distribution of survey /

Jadual 1(a): Kaji selidik mengikut taburan umur

- i. Draw a frequency polygon to represent the above data.
Lukiskan poligon kekerapan bagi mempersembahkan data di atas.

[4 marks]

[4 markah]

ii. Based on the data given in the table above, draw a "less than" ogive.

Merujuk data di atas, lukiskan ogif "kurang daripada".

[6 marks]

[6 markah]

CLO2
C3

b) Table 1(b) shows the years of working experience for 120 employees of Camelia's company.

Jadual 1 (b) menunjukkan tahun pengalaman bekerja di Syarikat Camelia bagi 120 pekerja.

Years of experience	Number of employees
1-4	16
5-8	20
9-12	28
13-16	24
17-20	16
21-24	11
25-28	5
Total	120

Table 1 (b) Years of experience at Camelia's company /

Jadual 1(b): Tahun pengalaman bekerja di Syarikat Camelia.

Based on Table 1 (b), using a suitable formula to calculate:

Berdasarkan jadual 1 (b), kirakan soalan berikut menggunakan formula yang sesuai:

i. Mean

Min

[4 marks]

[4 markah]

ii. Mode

Mod

[3 marks]

[3 markah]

iii. Median

Median

[3 marks]

[3 markah]

iv. Variance

Varians

[4 marks]

[4 markah]

v. Standard deviation

Sisihan piawai

[1 mark]

[1 markah]

QUESTION 2

SOALAN 2

CLO2
C2

- a) A bookcase has 280 books on Biology, Physics and Chemistry. 100 of the books are Physics books. If a book is chosen at random from the bookcase, the probability that it is a Biology book is $\frac{1}{4}$. Calculate the number of Chemistry books.

Satu tempat penyimpanan buku mengandungi 280 buah buku yang terdiri daripada Biologi, Fizik dan Kimia. 100 buah daripada buku tersebut adalah terdiri daripada buku Fizik. Sekiranya satu buku dipilih secara rawak daripada tempat penyimpanan buku tersebut, kebarangkalian ianya adalah buku Biologi adalah $\frac{1}{4}$. Hitungkan bilangan buku Kimia.

[3 marks]

[3 markah]

CLO2
C2

- b) The shelf displays 50 packets of chocolate where 15 packets are of brand A, 17 packets are of brand B and the rest are brand C. One packet of chocolate is taken and not replaced by a customer. Then, a second packet of chocolate is taken by another customer. Determine the probability that:

Dalam sebuah rak terdapat 50 paket coklat di mana 15 paket daripada jenama A, 17 paket daripada jenama B dan selebihnya jenama C. Satu paket coklat diambil oleh seorang pelanggan tanpa dipulangkan kembali. Seterusnya, paket kedua diambil oleh pelanggan yang lain. Tentukan kebarangkalian:

- i. Both packets of chocolate are brand C.

Kedua-dua paket coklat adalah daripada jenama C.

[4 marks]

[4 markah]

- ii. The first packet of chocolate from brand A and the second packet of chocolate from brand B.

Paket pertama coklat daripada jenama A dan paket kedua coklat daripada jenama B.

[3 marks]

[3 markah]

- c) A survey is conducted among 100 students who have graduated from a university, 20 of them are employed and 80 are not employed. 15 of the employed students are female and 55 of the unemployed students are male. If a student is selected at random, find the probability of selecting the following:

Satu kajian telah dijalankan terhadap 100 orang pelajar universiti yang telah menamatkan pengajian, seramai 20 orang pelajar telah bekerja dan 80 orang masih menganggur. 15 orang pelajar yang bekerja terdiri daripada pelajar perempuan dan 55 orang pelajar lagi yang menganggur adalah lelaki. Sekiranya pelajar tersebut dipilih secara rawak, cari kebarangkalian bagi pilihan berikut:

- i. students are employed or female

Pelajar yang telah bekerja atau perempuan

[6 marks]

[6 markah]

- ii. students are unemployed or female

Pelajar menganggur atau perempuan

[3 marks]

[3 markah]

- iii. students are female given that the students are not employed

pelajar adalah perempuan dengan keadaan pelajar tidak bekerja

[3 marks]

[3 markah]

- iv. students are employed given that the students are female

pelajar bekerja dengan keadaan pelajar adalah perempuan

[3 marks]

[3 markah]

QUESTION 3

SOALAN 3

CLO2
C2

- a) Construct the inequality for the following cases.

Bina ketaksamaan bagi kes-kes berikut.

- i. The speed limit (
- s
-) of a motorcycle is does not exceed 110 km/h.

Had kelajuan (s) motorsikal adalah tidak melebihi 110 km/j[1 mark]
[1 markah]

- ii. The distance (
- d
-) between two buildings is less than 3 m.

Jarak (d) di antara dua bangunan adalah kurang daripada 3 m.[1 mark]
[1 markah]

- iii. The length (
- l
-) of a class room is at least 18 m.

Panjang (l) bagi sebuah kelas adalah sekurang-kurangnya 18 m.[2 marks]
[2 markah]CLO2
C2

- b) A man wants to buy motorcycles and cars. The number of motorcycles bought are at least 6. The number of cars bought are not more than 18. The number of cars must exceed the number of motorcycles by at least 3. Write down three inequalities that satisfy the conditions above.

Seorang lelaki ingin membeli motorsikal dan kereta. Bilangan motorsikal dibeli adalah sekurang-sekurangnya 6. Bilangan kereta yang dibeli adalah tidak lebih daripada 18. Bilangan kereta mestilah melebihi motorsikal dengan sekurang-kurangnya 3. Tuliskan 3 ketaksamaan yang memenuhi keadaan di atas.[6 marks]
[6 markah]CLO2
C3

- c) Mr. Ahmad sells two types of fried noodles. A pack of plain noodles uses 120 g of prawns and 300 g of beef, while the special fried noodles uses 240 g of prawns and 200 g of beef. Mr. Ahmad has 8.4 kg of prawns and 12 kg of beef to make
- x
- packs of plain noodles and
- y
- packs of special noodles. The number of packs for plain noodles cannot be more than two times the number of special noodles.

En. Ahmad menjual 2 jenis mi goreng. 1 pek mi goreng biasa menggunakan 120 g udang dan 300 g daging manakala 1 pek mi goreng istimewa menggunakan 240 g udang dan 200 g daging. En. Ahmad mempunyai 8.4 kg udang dan 12 kg daging untuk menghasilkan x pek mi goreng biasa dan y pek mi goreng istimewa. Bilangan pek mi goreng biasa adalah tidak melebihi 2 kali bilangan mi goreng istimewa.

- i. Write down 3 inequalities other than
- $x \geq 0$
- and
- $y \geq 0$
- , that satisfy all of the above constraints.

Nyatakan tiga ketaksamaan selain $x \geq 0$ dan $y \geq 0$, yang memenuhi kekangan di atas.[3 marks]
[3 markah]

- ii. Using a scale of 2 cm to 10 units for
- x
- axis and 2 cm for 5 units for the
- y
- axis, draw and shade the feasible region which satisfied all the given constraints.

Menggunakan skala 2cm bersamaan 10 unit bagi paksi- x dan 2cm bersamaan 5 unit bagi paksi- y , lukis dan lorekkan rantau yang memenuhi kekangan yang diberi.[7 marks]
[7 markah]

iii. Use the graph in ii) to answer the following questions :

Guna graf pada soalan ii) untuk menjawab soalan-soalan berikut :

If Mr. Ahmad fries the special noodles 10 packs more than the plain noodles, state the maximum packs of plain noodles and special noodles cooked.

Jika En. Ahmad menghasilkan 10 pek mi goreng istimewa lebih daripada mi goreng biasa, nyatakan bilangan maksimum mi goreng istimewa dan mi goreng biasa yang dihasilkan.

[3 marks]

[3 markah]

iv. Use the graph in ii) to answer the following questions :

Guna graf pada soalan ii) untuk menjawab soalan-soalan berikut :

What is the maximum profit obtained if a pack of plain noodles and a pack of special noodles cost RM5 and RM7 each?

Berapakah keuntungan maksimum yang diperolehi jika pek mi goreng biasa dan pek mi goreng istimewa dijual dengan harga RM5 dan RM7 setiap satu?

[2 marks]

[2 markah]

QUESTION 4

SOALAN 4

CLO2
C2

a) Given Linear Programming problem where maximum $P = 3x + 2y + z$.

Diberi permasalahan Pengaturcaraan Linear dengan nilai maksimum $P = 3x + 2y + z$.

With constraints,

Dengan kekangan-kekangan

$$4x + y + z \leq 30$$

$$2x + 3y + z \leq 60$$

$$x + 2y + 3z \leq 40$$

Where $x, y, z \geq 0$

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

i. Write the objective function of the Linear Programming problem above in standard form.

Tuliskan semula fungsi objektif permasalahan Pengaturcaraan Linear di atas dalam bentuk asas.

[2 marks]

[2 markah]

ii. Write the corresponding system of constraints equation in standard form.

Tuliskan persamaan kekangan-kekangan yang sepadan dalam bentuk asas.

[3 marks]

[3 markah]

iii. Convert the following standard form into first initial tableau.

Tukarkan bentuk am berikut kepada bentuk Jadual Permulaan. [5 marks]

[5 markah]

CLO2
C3

- b) Solve the linear programming problem by using the Simplex method.
Selesaikan Persamaan Linear berikut dengan menggunakan kaedah Simplex.

$$\text{Max } P = x_1 + 2x_2$$

Subject to the constraints of:

Memenuhi kekangan-kekangan berikut:

$$x_1 + 4x_2 \leq 8$$

$$x_1 + x_2 \leq 12$$

$$x_1, x_2 \geq 0$$

[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. State **TWO (2)** methods to find roots of non-linear equations.

Nyatakan DUA (2) kaedah untuk mencari punca persamaan tak linear.

[2 marks]

[2 markah]

- ii. Determine an approximate of the equation $f(x) = x^2 - 5x + 1$ using Fixed Point Iteration Method. (Given $x_0 = 1$, and give your answer in 3 decimal places)

Tentukan nilai anggaran persamaan $f(x) = x^2 - 5x + 1$ dengan menggunakan kaedah Pengulangan. (Diberi $x_0 = 1$, berikan jawapan anda betul kepada 3 tempat perpuluhan)

[8 marks]

[8 markah]

CLO1
C3

- b. The simultaneous equation is given as below.

Diberi persamaan serentak seperti di bawah

$$5x - 2y - 3z = -3$$

$$4y + 3z = -2$$

$$x - 4y + 9z = 60$$

- i. Convert the simultaneous equation into matrix form
-
- Tukarkan persamaan serentak ke dalam bentuk matrik.*

[3 marks]

[3 markah]

- ii. Find the value of LU-factorization of the following matrix above using the Crout Method.

Cari nilai LU bagi persamaan matrik di atas dengan menggunakan kaedah Crout.

[12 marks]

[12 markah]

QUESTION 6

SOALAN 6

CLO1
C2

- a) Form a differential equation for each of the following functions:

Bentukkan persamaan pembezaan bagi fungsi-fungsi berikut:

i. $y = Bx^4 + x^2$

[5 marks]
[5 markah]

ii. $y = Ae^{6x} + Be^{6x}$

[5 marks]
[5 markah]CLO1
C3

- b) Solve the following second order differential equations:

Selesaikan persamaan pembezaan susunan kedua berikut:

i. $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} - 21y = 0$

[5 marks]
[5 markah]

ii. $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = 0$

[5 marks]
[5 markah]

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

[5 marks]
[5 markah]

SECTION C: 25 MARKS

BAHAGIAN C: 25 MARKAH

INSTRUCTION:

Answer ONE (1) question from section A or B or any questions that have not answered yet.

ARAHAN:

Jawab SATU (1) soalan dari bahagian A dan B atau mana-mana soalan yang belum dijawab.

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	$s^2 = \frac{\sum (x - \bar{x})^2}{n}$	$s^2 = \frac{\sum x_i^2 - n\bar{x}^2}{n}$
	$s^2 = \frac{\sum [(x - \bar{x})^2 f]}{\sum f}$	$s^2 = \frac{\sum fx^2}{\sum f} - \left[\frac{\sum fx}{\sum f} \right]^2$
Standard Deviation	$s = \sqrt{\text{var iance}}$	

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.	$\int \sec^2(ax+b) dx = \frac{1}{\frac{d}{dx}(ax+b)} \times \tan(ax+b) + c$		