

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN MALAYSIA**

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2019

DBM3013 : ENGINEERING MATHEMATICS 3

TARIKH : 31 OKTOBER 2019

MASA : 2.30 PETANG - 4.30 PETANG (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.

Bahagian A: Subjektif (4 soalan)

Bahagian B: Subjektif (2 soalan)

Dokumen sokongan yang disertakan : Formula Dan Kertas Graf

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)** subjective questions. Answer **THREE (3)** questions only.

ARAHAN:

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

QUESTION 1**SOALAN 1**

CLO2
C2

- a) The Table 1(a) shows the number of winning games by men's volleyball team.
Jadual menunjukkan bilangan kemenangan bagi pasukan bola tampar lelaki.

Year <i>Tahun</i>	2006	2007	2008	2009	2010	2011	2012	2013
Frequency <i>Kekerapan</i>	6	12	8	7	10	14	13	11

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

- i. Plot a line graph for the data in the Table 1(a).

Plotkan graf garis untuk data dalam Jadual 1(a).

[6 marks]

[6 markah]

- ii. In which year the team won more than 10 times.

Pada tahun berapakah kumpulan tersebut menang melebihi 10 kali?

[2 marks]

[2 markah]

- iii. In which year the team won less than 12 times.

Pada tahun berapakah kumpulan tersebut menang tidak melebihi 12 kali?

[2 marks]

[2 markah]

CLO2
C3

- b) Table 1(b) shows a survey conducted at Engineering Faculty. The columns represent the students' age range and the frequency of possessing mobile phones.

Jadual 1(b) menunjukkan kaji selidik yang dijalankan di Fakulti Kejuruteraan. Lajur mewakili umur pelajar dan kekerapan yang memiliki telefon bimbit.

Ages <i>Umur</i>	Frequency of Possessing Phones <i>Kekerapan memiliki telefon bimbit</i>
20-24	3
25-29	2
30-34	6
35-39	5

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

From the table above, find:

Daripada jadual di atas, cari:

- i) Mean
Min

[4 marks]

[4 markah]

- ii) Median
Median

[5 marks]

[5 markah]

- iii) Mode
Mode

[6 marks]

[6 markah]

QUESTION 2

SOALAN 2

CLO2
C2

- a) i) In a cricket match, a batsman hit a boundary 6 times out of 30 balls he played. Find the probability that she did not hit a boundary.

Dalam perlawanan kriket, seorang pemukul bola melangkaui sempadan 6 kali daripada 30 pukulan yang dilontarnya. Cari kebarangkalian bahawa pukulannya tidak melangkaui sempadan.

[5 marks]

[5 markah]

- ii) A bag contains 20 balls where 3 are red, 6 are green, 4 are blue, 2 are white and 5 are yellow. One ball is selected at random. Find the probabilities of the following events.

Satu beg mengandungi 20 biji bola, 3 berwarna merah, 6 berwarna hijau, 4 berwarna biru, 2 berwarna putih dan 5 berwarna kuning. Satu bola dipilih secara rawak. Cari kebarangkalian untuk peristiwa yang berikut:

- a. the ball is either red or green.

bola itu berwarna merah atau hijau

[3 marks]

[3 markah]

- b. the ball is not blue.

bola itu bukan berwarna biru.

[2 marks]

[2 markah]

CLO2
C3

- b) i) A basket has 12 roses and 8 tulips. If we pick two flowers at a time with a replacement, find the probability of getting a rose and a tulip.

Satu bakul mempunyai 12 bunga mawar dan 8 bunga tulip. Jika kita memilih dua bunga satu demi satu dengan penggantian, cari kebarangkalian mendapatkan satu mawar dan satu tulip.

[6 marks]

[6 markah]

- ii) Ten pieces of paper numbered from 21 to 30 are placed in a pocket file. A piece of paper is picked at random from the pocket file. Find the probability of picking a even number or divisible by 3.

Sepuluh keping kertas yang bernombor dari 21 hingga 30 diletakkan dalam fail poket. Sekeping kertas dipilih secara rawak dari fail poket. Cari kebarangkalian memilih nombor yang genap atau boleh dibahagikan tepat dengan 3.

[9 marks]

[9 markah]

QUESTION 3

SOALAN 3

CLO2
C2

- a) i. Write the inequality for the following statements:

Tuliskan ketaksamaan bagi pernyataan-pernyataan berikut:

- a. The volume (V) of ink production is at least 1000L.

Isipadu (V) bagi penghasilan dakwat adalah sekurang-kurangnya 1000L.

[1 mark]

[1 markah]

- b. The total number of students registered for volleyball club is not less than 24 people.

Jumlah pelajar yang mendaftar untuk kelab bola tampar adalah tidak kurang dari 24 orang.

[1 mark]

[1 markah]

- c. The ratio of sugar to salt manufactured daily must not exceed 3:1.

Nisbah gula kepada garam yang dihasilkan setiap hari mestilah tidak melebihi 3:1.

[1 mark]

[1 markah]

- d. Mr. Lee spent not more than RM 500 to buy shirts and pants which cost RM 80 and RM 120 respectively.

Encik Lee membelanjakan tidak melebihi RM 500 untuk membeli baju dan seluar yang masing-masing berharga RM 80 dan RM 120 setiap satu.

[1 mark]

[1 markah]

- e. The total number of female and male teachers in a school is more than 37 people.

Jumlah bilangan guru lelaki dan wanita di sebuah sekolah melebihi 37 orang.

[1 mark]

[1 markah]

- ii. A retailer bought x kg of starfruit and y kg of apple. The price of starfruit was RM3.00/kg while RM2.50/kg for apple. He bought at least 12 kg of starfruit. The total weight of starfruit and apple were not more than 25 kg. The amount spent does not exceed RM 450.

Seorang peruncit membeli x kg buah belimbing dan y kg buah epal. Harga bagi buah belimbing adalah RM3.00/kg manakala buah epal RM2.50/kg. Peruncit itu membeli sekurang-kurangnya 12 kg buah belimbing. Jumlah keseluruhan berat buah belimbing dan epal adalah tidak melebihi 25 kg. Jumlah yang dibelanjakan adalah tidak lebih dari RM 450.

- a. State the variables for the case above.

Nyatakan pembolehubah-pembolehubah bagi kes di atas.

[2 marks]

[2 markah]

- b. List down **THREE (3)** inequalities other than $x \geq 0$ and $y \geq 0$.

*Senaraikan **TIGA (3)** ketaksamaan yang memenuhi syarat selain $x \geq 0$ dan $y \geq 0$.*

[3 marks]

[3 markah]

CLO2
C3

- b) *Given that maximum, $Z = 6x + 7y$ is subject to;*
Diberi maksimum, $Z = 6x + 7y$ tertakluk kepada;

$$x + y \leq 9$$

$$x - y \geq 4$$

$$5x + 3y \leq 36$$

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

Using a scale of 1 cm to 1 unit on both axis, draw and shade the feasible region which fulfill the given condition and calculate the maximum value for the above case.

Menggunakan skala 1 cm bersamaan 1 unit pada kedua-dua paksi, lukis dan lorekkan rantau tersaur bagi memenuhi syarat-syarat yang diberi untuk mendapatkan nilai maksima bagi kes di atas.

[15 marks]

[15 markah]

QUESTION 4

SOALAN 4

CLO2
C2

- a) Given the following Linear Programming Problems using Simplex method.

Diberi Persamaan Linear berikut dengan menggunakan kaedah Simpleks.

$$\text{Maximum } P = 8x + 10y + 7z$$

Subject to:

$$\text{Maksimum } P = 8x + 10y + 7z$$

Tertakluk kepada:

$$x + 3y + 2z \leq 10$$

$$x + 5y + z \leq 8$$

- 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 am berikut kepada bentuk Jadual Permulaan.

[6 marks]

[6 markah]

CLO2
C3

- b) Solve the following Linear Programming Problem by using the Simplex method.

Selesaikan masalah Persamaan Linear berikut dengan menggunakan Kaedah Simpleks.

$$\text{Max: } P = -4x + 6y$$

$$2x + 5y \leq 10$$

$$3x + y \leq 9$$

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

[15 marks]

[15 markah]

SECTION B: 25 MARKS**BAHAGIAN B: 25 MARKAH****INSTRUCTION:**

This section consists of **TWO (2)** subjective questions. Answer **One (1)** question only.

ARAHAN:

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

QUESTION 5**SOALAN 5**

CLO1
C2

- a) Determine the roots for equation $x - e^{-x} = 0$ correct to 3 decimal places by using Fixed Point Iteration method. Given that $x_0 = 3$.

Tentukan punca-punca bagi persamaan $x - e^{-x} = 0$ tepat kepada 3 titik perpuluhan dengan menggunakan Kaedah Fixed Point. Diberi $x_0 = 3$.

[10 marks]

[10 markah]

CLO1
C3

- b) Solve the following equations by using the Gaussian Elimination Method.

Selesaikan persamaan berikut dengan menggunakan Kaedah Gaussian Elimination.

$$3x - 6y + 5z = 6$$

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

$$4x + 8y - 8z = 10$$

[15 marks]

[15 markah]

QUESTION 6

SOALAN 6

CLO1
C2

- a) i) Construct the differential equation for:

Bina persamaan perbezaan bagi:

$$y = Ax^2 + 3x$$

[5 marks]

[5 markah]

- ii) Solve the first order differential equation for:

Selesaikan persamaan pembezaan peringkat pertama bagi:

$$3x \frac{dy}{dx} = 5 - x^3$$

[5 marks]

[5 markah]

CLO1
C3

- b) Find the general solution for the following second order differential equations:

Dapatkan penyelesaian am bagi persamaan pembezaan peringkat kedua berikut:

i. $\frac{1}{4} \frac{d^2 y}{dx^2} + \frac{dy}{dx} + 3y = 0$

[8 marks]

[8 markah]

ii. $8 \frac{d^2 \theta}{dt^2} + 8 \frac{d\theta}{dt} + 2\theta = 0$

[7 marks]

[7 markah]

SOALAN TAMAT

FORMULA DBM3013 - 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 = $L_{Mo} + \left[\frac{d_1}{d_1 + d_2} \right] C$	
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	$x_{n+1} = x_n - \frac{f(x)}{f'(x)}$
False Position Method	$x_0 = \frac{1}{y_2 - y_1} \begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \end{vmatrix}$

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

SOLUTION FOR 1 st ORDER DIFFERENTIAL EQUATION	
Homogeneous Equation $y = vx \quad \text{and} \quad \frac{dy}{dx} = v + x \frac{dv}{dx}$	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	$a \frac{d^2 y}{dx^2} + b \frac{dy}{dx} + cy = 0$
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.	$\frac{d}{dx}(x^n) = nx^{n-1}$ [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.	$\int \sec^2(ax+b) dx = \frac{1}{\frac{d}{dx}(ax+b)} \times \tan(ax+b) + c$		