SULIT

POLITEKNIK MALAYSIA

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

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI DISEMBER 2018

DBM3013: ENGINEERING MATHEMATICS 3

TARIKH : 13 APRIL 2019
MASA : 11.15 PAGI - 1.15 PETANG (2 JAM)

Kertas ini mengandungi **TIGA BELAS (13)** halaman bercetak.
Bahagian A: Struktur (4 soalan)
Bahagian B: Struktur (2 soalan)
Dokumen sokongan yang disertakan : Kertas Graf & Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

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 types of sport played by students of a school. Based on the data given, draw:

Jadual 1(a) menunjukkan jenis-jenis sukan yang disertai oleh pelajar di sebuah sekolah. Berdasarkan data yang diberi, lukiskan:

Sports	Badminton	Football	Hockey	Tennis	Volleyball
Number of Students	65	90	50	30	65

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

i. Horizontal bar graph

Carta palang melintang

[5 marks]

[*5 markah*]

ii. Pie chart

Carta pai

[5 marks]

[*5 markah*]

CLO2
C3

(b) Table 1(b) shows the distribution frequency of time period taken by 100 students solving the mathematical problem.

Jadual 1(b) menunjukkan taburan kekerapan bagi masa yang diambil oleh 100 orang pelajar untuk menyelesaikan masalah matematik.

Time (minute)	Frequency
6-10	8
11-15	17
16-20	20
21-25	19
26-30	18
31-35	11
36-40	7

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

From the table above, find:
Daripada jadual di atas, cari:

i. Mean.
Min.

[3 marks]
[*3 markah*]

ii. Mean deviation.
Sisihan min.

[5 marks]
[5 *markah*]

iii. Standard deviation.
Sisihan piawai.

[7 marks]
[*7 markah*]

QUESTION 2

SOALAN 2

CLO2
C2

(a) i. A container contains of 20 red glasses, 32 blue glasses, 17 yellow glasses and 11 white glasses. A glass is picked randomly from the container. What is the probability of picking a blue glass?

Sebuah bekas mengandungi 20 gelas merah, 32 gelas biru, 17 gelas kuning and 11 gelas putih. Gelas dipilih secara rawak dari bekas. Apakah kebarangkalian untuk mengambil gelas biru?

[2 marks]
[*2 markah*]

ii. A roulette wheel is divided into 10 equal sectors labelled as P, O, L, I, T, E, K, N, I and K. The wheel is spun twice. Find the probability that the wheel stopped on the letter I on the first spin and the letter K on the second spin.

Sebuah roda rolet dibahagikan kepada 10 bahagian yang sama besar yang dilabelkan dengan P, O, L, I, T, E, K, N, I dan K. Roda dipusing sebanyak dua kali. Cari kebarangkalian roda berhenti pada huruf I pada pusingan pertama dan huruf K pada pusingan kedua.

[2 marks]
[*2 markah*]

iii. Table 2(a) below shows the number of donuts in a box. Two donuts are selected from the box. Without replacing the donuts, what is the probability of getting 1 chocolate donut and 1 pink donut?

Jadual 2(a) di bawah menunjukkan bilangan donat dalam sebuah kotak. Dua biji donat dipilih daripada kotak tersebut. Tanpa memasukkan semula, apakah kebarangkalian untuk mendapatkan 1 donat coklat dan 1 donat merah jambu?

Donuts /*Donat*	**Number of donuts/*Bilangan donat***
Original Donuts	9
Chocolates Donuts	12
Pink Donuts	10

Table 2(a) / *Jadual 2(a)*

[6 marks]
[*6 markah*]

CLO2
C3

(b) A survey was done at a secondary school. The students was asked, "What is your favorite sport?" The results are summarized in Table 2(b) below:

Satu kaji selidik dijalankan di sebuah sekolah menengah. Pelajar telah ditanya, "Apakah sukan kegemaran anda?" Keputusan telah dirumuskan seperti di dalam Jadual 2(b) di bawah.

Sport House	**FootBall**	**Takraw**	**Softball**	**Total**
Hang Tuah	74	54	52	180
Hang Jebat	96	45	60	201
Hang Lekir	98	60	55	213

Table 2(b) / *Jadual 2(b)*

By using these students as a sample space, a student from this study is randomly selected. What is the probability that:

Dengan menggunakan pelajar-pelajar ini sebagai ruang sampel, pelajar dipilih secara rawak. Apakah kebarangkaian jika:

i. Selecting a student whose favorite sport is takraw?
Memilih pelajar yang sukan kegemaran adalah takraw?

[3 marks]
[*3 markah*]

ii. Selecting a student from Hang Tuah sport house?
Memilih pelajar daripada rumah sukan Hang Tuah?

[3 marks]
[3 *markah*]

iii. The student selected is from Hang Jebat sport house and not prefer softball?
Memilih pelajar daripada rumah sukan Hang Jebat, yang tidak suka sofbal?

[5 marks]
[5 *markah*]

iv. The student selected is from Hang Lekir sport house and student prefers football or softball?
Memilih pelajar daripada rumah sukan Hang Lekir, yang suka bola sepak atau sofbal?

[4 marks]
[*4 markah*]

QUESTION 3
SOALAN 3

CLO2
C2

(a) i. Write the inequality for the following statements:
Nyatakan ketaksamaan bagi penyataan-penyataan dibawah:

a. The volume (V) of revolution is greater than $30m^3$.
Isipadu (V) pusingan melebihi $30m^3$.

[1 mark]
[*1 markah*]

b. The height (h) of a cylinder is less than 5m.
Ketinggian (h) sebuah silinder kurang daripada 5m.

[1 mark]
[*1 markah*]

c. The area (A) enclosed between the two curves is not more than $40m^2$.
Keluasan (A) di antara dua lengkung tidak melebihi $40m^2$.

[1 mark]
[*1 markah*]

d. The number of burger (B) cannot be more than two times the number of noodles (N).
Bilangan burger(B) tidak boleh melebihi dua kali jumlah mee (N).

[1 mark]
[*1 markah*]

e. The profit (P) of selling perfume is at least RM300.
Keuntungan (P) menjual minyak wangi adalah sekurang-kurangnya RM300.

[1 mark]
[*1 markah*]

ii. A farmer is planning to build single and double storey farm house. At most 40 houses could be built in that area. The number of single houses is not more than three times the number of double-storey houses. At least 26 single houses need to be built.

Seorang petani merancang untuk membina rumah satu tingkat dan dua tingkat. Paling banyak 40 buah rumah boleh dibina di kawasan itu. Bilangan rumah satu tingkat adalah tidak lebih daripada tiga kali ganda bilangan rumah dua tingkat. Sekurang-kurangnya 26 buah rumah satu tingkat perlu dibina.

a. State the variable for this case.
Nyatakan pembolehubah-pembolehubah bagi kes di atas.

[2 marks]
[*2 markah*]

b. List down three inequalities other than $x \geq 0$ and $y \geq 0$
Senaraikan tiga ketaksamaan yang memenuhi syarat di atas selain $x \geq 0$ *dan* $y \geq 0$

[3 marks]
[*3 markah*]

CLO2
C3

(b) Given maximize ,$Z = 5x + 9y$

Subject to:

Diberi maksimum , $Z = 5x + 9y$

Tertakluk kepada:

$$180x + 350y \leq 15000$$
$$150x + 90y \leq 9400$$
$$x \leq 2y$$
Always $x, y \geq 0$

Using a scale of 2 cm to 2 units on the axis, draw and shade the feasible region which satisfied the given condition and calculate the maximum to obtain the maximum value for the above case.

Menggunakan skala 2 cm bersamaan 2 units 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) Fazura is a part time tailor. She only sews *Kurung* and *Kebaya* for her customer. Each *Kurung* required 1 hour of cutting and 2 hours of sewing. Meanwhile, each *Kebaya* required 2 hours of cutting and 2 hours of sewing. She only spent 18 hours of cutting and 20 hours of sewing every week. Fazura will get RM30 and RM45 profit for each *Kurung* and *Kebaya* respectively.

Fazura seorang tukang jahit sambilan. Beliau hanya menjahit Kurung dan Kebaya untuk pelanggannya. Setiap Kurung memerlukan 1 jam untuk memotong dan 2 jam untuk menjahit. Manakala, setiap Kebaya memerlukan 2 jam untuk memotong dan 2 jam untuk menjahit. Beliau hanya memperuntukkan 18 jam untuk memotong dan 20 jam untuk menjahit setiap minggu. Fazura akan mendapat keuntungan masing-masing RM30 dan RM45 bagi setiap Kurung dan Kebaya.

i. Write **TWO (2)** inequalities that satisfy the conditions above other than $x \geq 0, y \geq 0$

*Tuliskan **DUA (2)** ketaksamaan yang memenuhi syarat-syarat di atas selain daripada* $x \geq 0, y \geq 0$

[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 linear programming problem by using the Simplex method.

Selesaikan Persamaan Linear berikut dengan menggunakan kaedah Simpleks.

Max: $P = 3x + 5y$

$$3x + 2y \leq 12$$

$$x + 3y \leq 11$$

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

[15 marks]

[*15 markah*]

SECTION B: 25 MARKS

BAHAGIAN B: 25 MARKAH

INSTRUCTION:

This section consists of **TWO (2)** 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) By using Newton-Raphson method, determine the root for $5x^2 - 4x^{\frac{3}{2}} - 6 = 0$. Given $x_0 = 1.5$. Give the answer correct to four decimal places.

Dengan menggunakan Kaedah Newton-Raphson, tentukan punca persamaan $5x^2 - 4x^{\frac{3}{2}} - 6 = 0$. *Diberi* $x_0 = 1.5$. *Berikan jawapan yang betul untuk empat titik perpuluhan.*

[10 marks]

[*10 markah*]

CLO1
C3

(b) Find the matrix L and U for the equation below using Doolittle Method.

Dapatkan matrix L dan U untuk persamaan di bawah menggunakan Kaedah Doolittle.

$$s + 4t - 2u = 3$$
$$3s - 2t + 5u = 14$$
$$2s + 3t + u = 11$$

[15 marks]

[*15 markah*]

QUESTION 6

SOALAN 6

CLO1 C2

(a) Use linear equation method to solve the first order differential equation.

Gunakan kaedah persamaan linear untuk selesaikan persamaan pembezaan peringkat pertama berikut.

$$2\frac{dy}{dx} + 4y = 2e^{3x}$$

[10 marks]

[*10 markah*]

CLO1 C3

(b) Solve the following second order differential equations.

Selesaikan persamaan pembezaan peringkat kedua yang berikut.

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

[4 marks]

[*4 markah*]

ii. $6\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 1 = 0$

[4 marks]

[*4 markah*]

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

[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	$E = \frac{\sum \lvert x - \bar{x} \rvert}{n}$	$E = \frac{\sum (\lvert x - \bar{x} \rvert f)}{\sum f}$
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	$s = \sqrt{\text{var } iance}$	

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

SOLUTION FOR 1st ORDER DIFFERENTIAL EQUATION	
Homogeneous Equation $y = vx$ and $\frac{dy}{dx} = v + x\frac{dv}{dx}$	Linear Factors (Integrating Factors) $y \bullet IF = \int Q \bullet IF\, dx$ 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 2nd ORDER DIFFERENTIAL EQUATION	
Equation of the form $a\frac{d^2y}{dx^2} + b\frac{dy}{dx} + cy = 0$	
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.	$\frac{d}{dx}\big(f(x) \pm g(x)\big) = f'(x) \pm g'(x)$
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.	$\frac{d}{dx}\left(e^{ax+b}\right) = e^{ax+b} \times \frac{d}{dx}(ax+b)$	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.	$\int ax^n dx = \frac{ax^{n+1}}{n+1} + c \quad ;\{n \neq -1\}$	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.	$\int sec^2(ax+b)\ dx = \frac{1}{\frac{d}{dx}(ax+b)} \times \tan(ax+b) + c$		