SULIT

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI DISEMBER 2017

DBM3023 : ELECTRICAL ENGINEERING MATHEMATICS

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

Kertas ini mengandungi **SEMBILAN (9)** 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)

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 di perlukan dalam penghasilan sebuah buku.

Items ***Item***	**Percentage of expenses** ***Peratus Perbelanjaan***
Printing *Percetakan*	25%
Transportation *Pengangkutan*	15%
Paper *Kertas*	30%
Binding *Penjilidan*	20%
Promotion *Promosi*	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) *Masa (Minit)*	Number of Students *Bilangan Pelajar*
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) Determine the Laplace Transform for the following functions by using the definition $F(s)=\int_0^{\infty} e^{-st} f(t)dt$.

Tentukan Jelmaan Laplace bagi fungsi-fungsi berikut dengan menggunakan takrif $F(s)=\int_0^{\infty} e^{-st} f(t)dt$

i. $f(t)=\frac{8}{3}$

[4 marks]

[*4 markah*]

ii. $f(t)=2e^{-pt}$

[6 marks]

[*6 markah*]

CLO2 C3

(b) Determine the Laplace Transform for each the following functions.

Tentukan Jelmaan Laplace bagi setiap fungsi-fungsi berikut.

i. $f(t)=2e^{-4t}-\frac{4\sinh 2t}{3}$

[4 marks]

[*4 markah*]

ii. $f(t)=e^{t}(t+2)^2$

[5 marks]

[*5 markah*]

iii. $f(t)=t\cos 4t$ by using the Theorem of Multiplication with t^n.

$f(t)=t\cos 4t$ dengan menggunakan *Teorem Pendaraban* t^n

[6 marks]

[*6 markah*]

QUESTION 4

SOALAN 4

CLO2 C2

(a) Determine the Inverse Laplace Transform for:

Tentukan Jelmaan Laplace Songsang bagi:

i. $F(s)=\dfrac{5}{s+3}$

[2 marks]

[*2 markah*]

ii. $F(s)=\dfrac{7}{s^2-9}$

[3 marks]

[*3 markah*]

iii. $F(s)=\dfrac{2s+2}{s^2+2s-15}$

[5 marks]

[*5 markah*]

CLO2 C3

(b)

i. Find the Inverse Laplace Transform of $F(s)=\dfrac{3s+7}{(s-2)(s+3)}$ using partial fraction method.

Cari Jelmaan Laplace Songsang bagi $F(s)=\dfrac{3s+7}{(s-2)(s+3)}$ *menggunakan kaedah pecahan separa.*

[6 marks]

[*6 markah*]

ii. Solve the differential equation $\dfrac{dy}{dt}+3y=e^{-4t}$. Given that $y(0)=0$.

Selesaikan persamaan pembezaan $\dfrac{dy}{dt}+3y=e^{-4t}$. Diberi bahawa $y(0)=0$.

[9 marks]

[*9 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*]

FORMULA DBM3023- ELECTRICAL ENGINEERING MATHEMATICS

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:	$y=Ae^{m_1x}+Be^{m_2x}$
2. Real & equal roots:	$y=e^{mx}(A+Bx)$
3. Complex roots:	$y=e^{\alpha x}(A\cos\beta x+B\sin\beta x)$

LAPLACE TRANSFORM					
No.	$f(t)$	$F(s)$		$f(t)$	$F(s)$
1.	a	$\frac{a}{s}$	13.	$e^{-at}\sin \omega t$	$\frac{\omega}{(s+a)^2+\omega^2}$
2.	at	$\frac{a}{s^2}$	14.	$e^{-at}\cos \omega t$	$\frac{s+a}{(s+a)^2+\omega^2}$
3.	t^n	$\frac{n!}{s^{n+1}}$	15.	$\sinh \omega t$	$\frac{\omega}{s^2-\omega^2}$
4.	e^{at}	$\frac{1}{s-a}$	16.	$\cosh \omega t$	$\frac{s}{s^2-\omega^2}$
5.	e^{-at}	$\frac{1}{s+a}$	17.	$e^{at}\sinh \omega t$	$\frac{\omega}{(s-a)^2-\omega^2}$
6.	te^{-at}	$\frac{1}{(s+a)^2}$	18.	$e^{-at}\sinh \omega t$	$\frac{\omega}{(s+a)^2-\omega^2}$
7.	$t^n.e^{at}$, n=1,2,3	$\frac{n!}{(s-a)^{n+1}}$	19.	$e^{-at}\cosh \omega t$	$\frac{s+a}{(s+a)^2-\omega^2}$
8.	$t^n.f(t)$	$(-1)^n\frac{d^n}{ds^n}[F(s)]$	20.	$f_1(t)+f_2(t)$	$F_1(s)+F_2(s)$
9.	$\sin \omega t$	$\frac{\omega}{s^2+\omega^2}$	21.	$\int_o^t f(u)du$	$\frac{F(s)}{s}$
10.	$\cos \omega t$	$\frac{s}{s^2+\omega^2}$	22.	$f(t-a)u(t-a)$	$e^{-as}F(s)$
11.	$t\sin \omega t$	$\frac{2\omega s}{(s^2+\omega^2)^2}$	23.	First derivative $\frac{dy}{dt}, y'(t)$	$sY(s)-y(0)$
12.	$t\cos \omega t$	$\frac{s^2-\omega^2}{(s^2+\omega^2)^2}$	24.	Second derivative $\frac{d^2y}{dt^2}, y''(t)$	$s^2Y(s)-sy(0)-y'(0)$

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