SULIT

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

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2018

DBM3023: ELECTRICAL ENGINEERING MATHEMATICS

TARIKH : 09 NOVEMBER 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 & 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 only **THREE** (3) questions.

ARAHAN :

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

QUESTION 1

SOALAN 1

CLO2
C2

(a) Given the mean of the data (x-5), (x+5), (x+8), (3x-4), (4x+7) is 12.2.
Diberi min bagi set data (x-5), (x+5), (x+8), (3x-4), (4x+7) ialah 12.2.

i. Find the value of x.
Cari nilai x.

[4 marks]
[*4 markah*]

ii. Then, find the variance and standard deviation of the data.
Kemudian, cari varian dan sisihan piawai bagi data tersebut.

[6 marks]
[*6 markah*]

CLO2
C3

(b)

12	10	22	23	25	41	41	20	90	25
65	13	89	47	33	52	47	65	66	32
55	13	88	37	81	53	50	64	71	90
45	90	19	57	73	53	11	30	72	44
34	87	17	67	80	11	14	15	70	40

i. Based on the data given above, draw a "less than" ogive graph, using 5-14 as a first class.

Berdasarkan data yang diberikan di atas, lukis ogif "kurang daripada", dengan menggunakan 5-14 sebagai kelas pertama.

[9 marks]

[*9 markah*]

ii. Then, determine the first quartile and 7^{th} decile from the given data.

Kemudian, tentukan nilai kuartil pertama dan nilai desil ke 7 dari data yang diberikan.

[6 marks]

[*6 markah*]

QUESTION 2

SOALAN 2

CLO2 C2

(a)

8	4	5	6	4	3	9

The diagram shows a telephone number. One digit is picked at random from the telephone number. Find the probability that the digit picked is:

Diagram menunjukkan satu nombor telefon. Satu digit diambil secara rawak daripada nombor telefon tersebut. Tentukan kebarangkalian digit yang diambil adalah:

i. number 4
nombor 4

[2 marks]
[*2 markah*]

ii. an odd number
nombor ganjil

[2 marks]
[*2 markah*]

iii. a multiple of 3 OR less than 7
gandaan 3 ATAU kurang dari 7

[6 marks]
[*6 markah*]

CLO2
C3

(b) Dina and Hafiz are invited to attend a wedding ceremony. The probability that Dina will attend the ceremony is 3/10 and the probability Hafiz will attend the ceremony is 4/7. Assume that both Dina and Hafiz do not influence each other to attend the ceremony, find the probability that:

Dina dan Hafiz telah dijemput ke majlis perkahwinan. Kebarangkalian Dina akan menghadirkan diri ialah 3/10 manakala kebarangkalian Hafiz akan menghadiri majlis tersebut ialah 4/7. Dengan anggapan bahawa Dina dan Hafiz tidak mempengaruhi antara satu sama lain untuk menghadiri majlis tersebut, tentukan kebarangkalian:

i. Both Dina and Hafiz will attend the ceremony.
Kedua-dua Dina dan Hafiz akan menghadiri majlis tersebut.

[3 marks]
[*3 markah*]

ii. None of them will attend the ceremony.
Tiada di antara mereka akan menghadiri majlis tersebut.

[3 marks]
[*3 markah*]

iii. Only one of them will attend the ceremony.
Hanya salah seorang dari mereka yang menghadiri majlis tersebut.

[4 marks]
[*4 markah*]

iv. At least one of them will attend the ceremony.
Sekurang-kurangnya seorang dari mereka yang menghadiri majlis tersebut.

[5 marks]
[*5 markah*]

QUESTION 3

SOALAN 3

CLO 2
C2

(a) Transform the function below by using the definition $F(s) = \int_0^\infty e^{-st} f(t)\, dt$.

Jelmakan fungsi di bawah dengan menggunakan takrif $F(s) = \int_0^\infty e^{-st} f(t)\, dt$

i. $f(t) = 2p$

[4 marks]

[*4 markah*]

ii. $f(t) = \left(e^{-t}\right)^2$

[6 marks]

[*6 markah*]

CLO 2
C3

(b) Use the specified method to transform the function below;

Gunakan kaedah yang dinyatakan untuk menjelmakan fungsi di bawah;

i. $f(t) = t^3(t+3)^2$

[Laplace Transform Table/ *Jadual Jelmaan Laplace*]

[4marks]

[*4 markah*]

ii. $f(t) = e^{2t}(\cosh 3t + \sinh t)$

[First Shift Theorem/*Teorem Anjakan Pertama*]

[5 marks]

[*5 markah*]

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

[Multiplication by t^n /*Pendaraban dengan* t^n]

[6 marks]

[*6 markah*]

QUESTION 4

SOALAN 4

CLO 2
C2

(a) Determine the Inverse Laplace Transform for;

Tentukan Jelmaan Laplace Songsang bagi;

i. $F(s) = \dfrac{9}{s + \dfrac{1}{2}}$

[2 marks]

[*2 markah*]

ii. $F(s) = \dfrac{1}{2s^3}$

[3 marks]

[*3 markah*]

iii. $F(s) = \dfrac{s+12}{(s+3)^2 + 36}$

[5 marks]

[*5 markah*]

CLO 2
C3

(b) Apply the partial fraction method to find the Inverse Laplace Transform of the following;

Gunakan kaedah pecahan separa untuk menari Jelmaan Laplace Songsang bagi yang berikut;

i. $F(s) = \dfrac{5}{s^2 - 100}$

[6 marks]

[*6 markah*]

ii. $F(s) = \dfrac{3s^2 - s - 1}{(s-2)(s+1)^2}$

[9 marks]

[*9 markah*]

SECTION B: 25 MARKS

BAHAGIAN B: 25 MARKAH

INSTRUCTION:

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

ARAHAN:

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

QUESTION 5

SOALAN 5

CLO1 C2 (a) i. State **THREE** (3) methods to find the root of linear equation.

Nyatakan TIGA (3) kaedah untuk mencari punca persamaan linear.

[3 marks]

[*3 markah*]

ii. Find the real root of $x^5 - x - 7 = 0$ with the initial value $x_0 = 2$. Give the correct answer to 4 decimal places.

Tentukan punca persamaan $x^5 - x - 7 = 0$ *dengan nilai awal* $x_0 = 2$. *Berikan jawapan tepat kepada 4 titik perpuluhan.*

[7 marks]

[*7 markah*]

CLO1 C3 (b) Solve the following linear equation using Gaussian Elimination Method. *Selesaikan persamaan linear berikut menggunakan Kaedah Penghapusan Gauss.*

$$\begin{aligned} 3x \quad -2y \quad +z &= 0 \\ -4x \quad +3y \quad -z &= -2 \\ 3x \quad +4y \quad +5z &= 6 \end{aligned}$$

[15 marks]

[*15 markah*]

QUESTION 6

SOALAN 6

CLO1 C2

(a) i. State the order and the degree for the following differential equation:

Nyatakan peringkat dan kuasa bagi persamaan pembezaan berikut:

a. $x\left(\frac{d^2y}{dx^2}\right)-\left(\frac{dy}{dx}\right)^4=4y$

[2 marks]

[*2 markah*]

b. $y=3x\left(\frac{d^2y}{dx^2}\right)^3+x\frac{dy}{dx}$

[2 marks]

[*2 markah*]

ii. Solve the second order of differential equations below:

Selesaikan persamaan pembezaan peringkat kedua di bawah:

$$2y''+6y'+16=10y'-4$$

[6 marks]

[6 *markah*]

CLO1 C3

(b) Solve the differential equation below by using an appropriate method.

Selesaikan persamaan pembezaan berikut dengan menggunakan kaedah yang sesuai.

i. $\frac{4dy}{(x^2+1)dx}=\frac{1}{2y}$

[4 marks]

[*4 markah*]

ii. $\frac{dy}{dx}=\frac{6y^3+6x^3}{6xy^2}$

[11 marks]

[*11 markah*]

SOALAN TAMAT

FORMULA SHEET FOR 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:	$y = Ae^{m_1 x} + Be^{m_2 x}$
2. Real & equal roots:	$y = e^{mx}(A + Bx)$
3. Complex roots:	$y = e^{\alpha x}(A\cos\beta x + B\sin\beta x)$

LAPLACE TRANSFORM					
No.	$f(t)$	$F(s)$	No.	$f(t)$	$F(s)$
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.	$\int_0^t f(u)du$	$\frac{F(s)}{s}$
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.	$\int ax^n dx = \frac{ax^{n+1}}{n+1} + c \;\; ;\{n \neq -1\}$	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.	$\int sec^2(ax+b)\, dx = \frac{1}{\frac{d}{dx}(ax+b)} \times \tan(ax+b) + c$		