SULIT

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

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2019

DBM30043 : ELECTRICAL ENGINEERING MATHEMATICS

TARIKH : 25 OKTOBER 2019
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **TUJUH (7)** halaman bercetak.
Subjektif : (4 soalan)
Dokumen sokongan yang disertakan : Formula dan Kertas Graf

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTION:

This section consists of **FOUR (4)** subjective questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan subjektif. Jawab semua soalan.*

QUESTION 1

SOALAN 1

CLO1
C3

a) Table 1(a) shows the marks obtained by 40 students in an examination.
Jadual 1(a) menunjukkan markah yang diperolehi oleh 40 orang pelajar dalam suatu peperiksaan.

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

62	54	38	33	80	66	56	60	68	52
57	71	85	47	50	71	52	76	49	69
48	68	55	49	79	41	61	65	75	81
64	58	66	59	52	43	65	48	41	56

i. Construct a frequency distribution table with a class width (class size) of 10 marks with the first class being 30-39.
Bina sebuah jadual taburan kekerapan dengan menggunakan lebar kelas (saiz kelas) 10 dengan permulaan kelas 30-39.

[3 marks]
[*3 markah*]

ii. Calculate the mean.
Kirakan min.

[5 marks]
[*5 markah*]

iii. Calculate the standard deviation for the data.
Kirakan sisihan piawai bagi data tersebut.

[7 marks]
[*7 markah*]

CLO1
C3

b) Table 1(b) shows the number of boys and girls in three groups A, B and C. A kid is chosen randomly from each groups. Determine the probability of choosing three kids that:

Jadual 1(b) di atas menunjukkan bilangan kanak-kanak lelaki dan perempuan dalam tiga kumpulan A, B dan C. Seorang kanak-kanak dipilih secara rawak daripada setiap kumpulan. Tentukan kebarangkalian memilih tiga orang kanak–kanak yang:

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

Group *(Kumpulan)*	Number of boys *(Bilangan kanak-kanak lelaki)*	Number of girls *(Bilangan kanak-kanak perempuan)*
A	3	2
B	4	4
C	4	5

i. All of them are girls.
Semuanya perempuan.

[2 marks]
[*2 markah*]

ii. All of them are boys.
Semuanya lelaki.

[3 marks]
[*3 markah*]

iii. Consists of a girl and two boys.
Terdiri daripada seorang perempuan dan dua lelaki.

[5 markah]
[*5 markah*]

QUESTION 2

SOALAN 2

CLO1 C3

a) Solve the linear equations by using Gauss Elimination Method.

Selesaikan persamaan berikut menggunakan Kaedah Penghapusan Gauss.

$$x + 2y - z = 2$$
$$3y + z + 4x = 3$$
$$2x + 2y + 3z = 5$$

[9 marks]

[*9 markah*]

CLO1 C3

b) Based on the following equations:

Berdasarkan persamaan berikut:

$$a + 2b - 2c = 1$$
$$2a + 8b - 8c = -2$$
$$-a + 10b - 8c = -3$$

Calculate matrix L and U by using Doolittle Method.

Kirakan matriks L dan U dengan menggunakan Kaedah Doolittle.

[10 marks]

[*10 markah*]

CLO1 C3

c) By using Newton-Raphson Method, determine the root for $x^3 + 3x^2 - 2 = 0$. Give the answer correct to three decimal places. Assume the first approximation as 1.

Dengan menggunakan kaedah Newton-Raphson, tentukan punca bagi persamaan $x^3 + 3x^2 - 2 = 0$. *Berikan jawapan kepada tiga tempat perpuluhan. Andaikan penghampiran pertama sebagai 1.*

[6 marks]

[*6 markah*]

QUESTION 3

SOALAN 3

CLO1 C3

a) Solve the following differential equations:

Selesaikan persamaan pembezaan berikut:

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

[5 marks]

[*5 markah*]

ii) $\frac{dy}{dx} + 2y = e^{-3x}$

[5 marks]

[*5 markah*]

CLO1 C3

b) Solve the following differential equations:

Selesaikan persamaan pembezaan berikut:

i) $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 63y = 0$

[5 marks]

[*5 markah*]

ii) $\frac{d^2y}{dx^2} - 18\frac{dy}{dx} + 81y = 0$

[4 marks]

[*4 markah*]

iii) $\frac{d^2y}{dx^2} + 7\frac{dy}{dx} + 20y = 0$

[6 marks]

[*6 markah*]

QUESTION 4

SOALAN 4

CLO1
C3

a) Determine the Laplace Transform for:

Tentukan Jelmaan Laplace bagi:

i. $f(t) = 3e^{2t}$ by using the definition $F(s) = \int_0^\infty e^{-st} f(t)dt$.

$f(t) = 3e^{2t}$ *dengan menggunakan takrif* $F(s) = \int_0^\infty e^{-st} f(t)dt$.

[6 marks]

[*6 markah*]

ii. $f(t) = 2e^{-3t} + t^4 - \sin 3t$ by using Table of Laplace Transform.

$f(t) = 2e^{-3t} + t^4 - \sin 3t$ *dengan menggunakan Jadual Jelmaan Laplace.*

[4 marks]

[*4 markah*]

iii. $f(t) = e^{3t} \cos 4t$ by using First Shift Theorem.

$f(t) = e^{3t} \cos 4t$ *dengan menggunakan Teorem Anjakan Pertama.*

[5 marks]

[*5 markah*]

CLO1
C3

b) Determine the Inverse Laplace Transform for:

Tentukan Jelmaan Laplace Songsang bagi:

i. $F(s) = \frac{8s}{s^2 + 9}$ by using Table of Laplace Transform.

$F(s) = \frac{8s}{s^2 + 9}$ *dengan menggunakan Jadual Laplace Transform.*

[2 marks]

[*2 markah*]

ii. $F(s) = \frac{5s - 4}{s^2 - s - 2}$ by using Partial Fraction.

$F(s) = \frac{5s - 4}{s^2 - s - 2}$ *dengan menggunakan Pecahan Separa.*

[8 marks]

[*8 markah*]

SOALAN TAMAT

FORMULA DBM30043 - ELECTRICAL ENGINEERING MATHEMATICS

<table>
<tr><th colspan="3">DESCRIPTIVE STATISTICS</th></tr>
<tr><td>Number of class</td><td>Sturges Rule, $k = 1 + 3.33 \log n$</td><td>Rule of Thumb, $2^k > n$</td></tr>
<tr><td>Mean</td><td>$\bar{x} = \frac{\sum x}{n}$</td><td>$\bar{x} = \frac{\sum (fx)}{\sum f}$</td></tr>
<tr><td>Median</td><td colspan="2">Median = $L_m + \left[\frac{\frac{N}{2} - F}{f_m}\right] C$</td></tr>
<tr><td>Mode</td><td colspan="2">Mode = $L_{Mo} + \left[\frac{d_1}{d_1 + d_2}\right] C$</td></tr>
<tr><td>Quartile</td><td colspan="2">$Q_k = L_{Q_k} + \left[\frac{\frac{kN}{4} - F}{f_{Q_k}}\right] C$; k = 1, 2, 3</td></tr>
<tr><td>Decile</td><td colspan="2">$D_k = L_{D_k} + \left[\frac{\frac{kN}{10} - F}{f_{D_k}}\right] C$; k = 1, 2, 3..... 9</td></tr>
<tr><td>Percentile</td><td colspan="2">$P_k = L_{P_k} + \left[\frac{\frac{kN}{100} - F}{f_{P_k}}\right] C$; k = 1, 2, 3 ..... 99</td></tr>
<tr><td>Mean Deviation</td><td>$E = \frac{\sum \left| x - \bar{x} \right|}{n}$</td><td>$E = \frac{\sum \left(\left| x - \bar{x} \right| f \right)}{\sum f}$</td></tr>
<tr><td rowspan="2">Variance</td><td>$s^2 = \frac{\sum \left(x - \bar{x} \right)^2}{n}$</td><td>$s^2 = \frac{\sum_{i=1}^{n} x_i^{\,2} - n\bar{x}^2}{n}$</td></tr>
<tr><td>$s^2 = \frac{\sum \left[\left(x - \bar{x} \right)^2 f \right]}{\sum f}$</td><td>$s^2 = \frac{\sum fx^2}{\sum f} - \left[\frac{\sum fx}{\sum f}\right]^2$</td></tr>
<tr><td>Standard Deviation</td><td colspan="2">$s = \sqrt{\text{var}\,iance}$</td></tr>
</table>

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	$x_{n+1}=x_n-\dfrac{f(x)}{f'(x)}$
False Position Method	$x_0=\dfrac{1}{y_2-y_1}\begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \end{vmatrix}$

PROBABILITY	
$E=pn$	$P(A\cup B)=P(A)+P(B)-P(A\cap B)$
$P(B\|A)=\dfrac{P(B\cap A)}{P(A)}$	$P(A\cap B)=P(A)\bullet P(B)$
	$P(A\cap B)=P(A)\bullet P(B\|A)$

SOLUTION FOR 1st ORDER DIFFERENTIAL EQUATION	
Homogeneous Equation $y=vx$ and $\dfrac{dy}{dx}=v+x\dfrac{dv}{dx}$	**Linear Factors (Integrating Factors)** $y\bullet IF=\int Q\bullet IF\,dx$ Where $IF=e^{\int P\,dx}$
	Logarithmic $a=e^{\ln a}$ $a^x=e^{x\ln a}$ $\int a^x\,dx=\dfrac{a^x}{\ln a}+c$
GENERAL SOLUTION FOR 2nd ORDER DIFFERENTIAL EQUATION	
Equation of the form	$a\dfrac{d^2y}{dx^2}+b\dfrac{dy}{dx}+cy=0$
Quadratics Formula	$x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$
1. Real & different roots2	$y=Ae^{m_1x}+Be^{m_2x}$
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.	$f(t)$	$F(s)$	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.	$\int_o^t f(u)du$	$\frac{F(s)}{s}$
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.**	$\frac{d}{dx}(x^n) = nx^{n-1} \quad [Power\ Rule]$
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.	$\frac{d}{dx}(uv) = u\frac{dv}{dx} + v\frac{du}{dx} \quad [Product\ Rule]$	**6.**	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2} \quad [Quotient\ Rule]$
7.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du} \quad [Chain\ Rule]$	**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.	$\int sec^2(ax+b)\ dx = \frac{1}{\frac{d}{dx}(ax+b)} \times \tan(ax+b) + c$		