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SULIT

POLITEKNIK MALAYSIA

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI JUN 2016

DBM3023: ELECTRICAL ENGINEERING MATHEMATICS

TARIKH : 27 OKTOBER 2016
MASA : 8.30 AM - 10.30 AM (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.
Bahagian A: Struktur (4 soalan)
Bahagian B: Struktur (2 soalan)
Bahagian C: Pilih **SATU (1)** soalan sahaja dari bahagian **A** atau **B** yang belum dijawab
Dokumen sokongan yang disertakan : Kertas Graf, Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A: 50 MARKS

BAHAGIAN A: 50 MARKAH

INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answer **TWO (2)** questions only.

ARAHAN :

*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **DUA (2)** soalan sahaja.*

QUESTION 1
SOALAN 1

CLO2 C2

(a) The table shows the number of readers of five types of entertainment magazines in Malaysia. Based on the data below, construct:

Jadual dibawah menunjukkan bilangan pembaca lima jenis majalah hiburan di malaysia. Berdasarkan data di bawah, bina:

i. Bar Chart / *Carta Bar*

ii. Pie Chart / *Carta Pie*

Magazine	URTV	Ujang	Media Hiburan	Intrend	Remaja
Number of readers	30	45	65	50	10

[10 marks]
[10 *markah*]

CLO2 C3

(b) Find the mean, mode and median for the data set below:

Cari min, mod dan median bagi set data di bawah:

50, 30, 10, 30, 40, 10, 10, 20, 50, 10

[6 marks]
[6 *markah*]

CLO2
C3

The table below shows the quiz marks obtained by 50 students of DAD3S2.
Find the mean deviation, variance and standard deviation for the data:

Jadual dibawah menunjukkan markah kuiz yang diperolehi oleh 50 orang pelajar kelas DAD3S2. Cari sisihan min, varians dan sisihan piawai bagi data berikut:

Score	10-19	20-29	30-39	40-49
Frequency	10	20	5	15

[9 marks]
[9*markah*]

QUESTION 2

SOALAN 2

CLO2
C2

(a) i. A container contains of 10 red plates, 15 blue plates, 8 yellow plates and 7 white plates. A plate is picked randomly from the container. What is the probability of picking a blue plate?

Sebuah bekas mengandungi 10 pinggan merah, 15 pinggan biru, 8 pinggan kuning and 7 pinggan putih. Pinggan dipilih secara rawak dari bekas. Apakah kebarangkalian untuk mengambil pinggan biru?

[2 marks]
[*2 markah*]

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

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

[2 marks]
[*2 markah*]

iii. The Table 2a in the next page shows the number of books in a box. Two books are selected from the box. Without replacing the books, what is the probability of getting 1 Bahasa Malaysia book and 1 English book?

Jadual 2a di halaman sebelah menunjukkan bilangan buku dalam sebuah kotak. Dua buah buku dipilih daripada kotak tersebut. Tanpa memasukkan semula, apakah kebarangkalian untuk mendapatkan 1 buku Bahasa Malaysia dan 1 buku Bahasa Inggeris?

Subject /*Subjek*	Number of books/*Bilangan buku*
Mathematics	4
Bahasa Malaysia	8
English	5

Table 2a/*Jadual 2a*

[6 marks]
[*6 markah*]

(b) i. The probabilities of Danial and Damia to be chosen as members of a committee are 3/5 and 7/9 respectively. Find the probability that neither of them is chosen as a member of the committee.

Kebarangkalian Danial dan Damia dipilih sebagai ahli jawatankuasa ialah 3/5 dan 7/9. Dapatkan kebarangkalian tiada seorang daripada mereka dipilih sebagai ahli jawatankuasa.

[3 marks]
[*3 markah*]

ii. The probabilities of Ahmad and Aina to be chosen as members of a committee are 2/3 and 5/8 respectively. Find the probability that only one of them is chosen as a member of the committee.

Kebarangkalian Ahmad dan Aina dipilih sebagai ahli jawatankuasa ialah 2/3 dan 5/8. Dapatkan kebarangkalian hanya salah seorang daripada mereka dipilih sebagai ahli jawatankuasa.

[8 marks]
[*8 markah*]

iii. The probability that the day is Monday and the student is absent is 0.05. The probability that the day is Monday is 0.2 because there are 5 school days in a week. What is the probability that a student is absent with the terms that the day is Monday?

Kebarangkalian bahawa hari itu adalah hari Isnin dan pelajar tidak hadir ialah 0.05. Kebarangkalian bahawa hari itu adalah Isnin ialah 0.2 kerana terdapat 5 hari persekolahan dalam seminggu. Apakah kebarangkalian bahawa pelajar tidak hadir dengan syarat hari itu adalah hari Isnin?

[4 marks]
[*4 markah*]

QUESTION 3

SOALAN 3

CLO2
C2

a) State the Laplace Transform for the following functions by using the definition $F(s)=\int_0^{\infty} e^{-st} f(t)dt$.

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

i. $f(t)=\frac{1}{7}$ [5 marks]
[*5 markah*]

ii. $f(t)=e^{-3t}$ [5 marks]
[*5 markah*]

CLO2
C3

b) Use the Laplace Transform Table to find the Laplace Transform for the following functions :

Dengan menggunakan Jadual Jelmaan Laplace, dapatkan Jelmaan Laplace bagi setiap fungsi yang berikut :

i. $f(t)=\cos 7t+\sin 4t$ [4 marks]
[*4 markah*]

ii. $f(t)=t^4+3t^2-6$ [5 marks]
[*5 markah*]

iii. $f(t)=e^{-5t}\cosh 3t$ [6 marks]
[*6 markah*]

QUESTION 4
SOALAN 4

CLO2
C2

a) Determine the Inverse Laplace Transform of:
Tentukan Inverse Laplace Transform:

i. $$F(s)=\frac{6}{s+8}-\frac{3}{s-5}+\frac{9}{s}$$

[5 marks]
[5 markah]

ii. $$F(s)=\frac{8}{s^2+64}+\frac{3s}{s^2+64}-\frac{1}{(s+2)^2}$$

[5 marks]
[5 markah]

CLO2
C3

b) Find the Inverse Laplace Transform for the following expressions by using Partial Fraction method.
Tentukan Inverse Laplace Transform bagi ungkapan berikut menggunakan kaedah Partial Fraction.

i. $$\frac{4s-5}{s^2-s-2}$$

[7 marks]
[7 markah]

ii. $$\frac{5s^2+8s-1}{(s+3)(s^2+1)}$$

[8 marks]
[8 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

CLO 1
C2

a) Solve the following equations by using the Gaussian Elimination Method.
Selesaikan persamaan berikut dengan menggunakan Kaedah Penghapusan Gauss.

$$x + 2y + z = 5$$
$$3x + 10y + 6z = 17$$
$$8y + 14z = 20$$

[10 marks]
[*10 markah*]

CLO 1
C3

b) Solve the equation $x^3 + 3x^2 - 2 = 0$ by using Newton-Raphson Method. Give the answer correct to 3 decimal places with an initial guess of $x_0 = 1$.
Selesaikan persamaan $x^3 + 3x^2 - 2 = 0$ menggunakan Kaedah Newton-Raphson. Berikan jawapan tepat kepada 3 tempat perpuluhan dengan tekaan awal $x_0 = 1$.

[15 marks]
[*15 markah*]

QUESTION 6
SOALAN 6

CLO1 C2

(a) Form a differential equation for each of the following functions:
Bentukkan persamaan pembezaan bagi fungsi-fungsi berikut:

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

[5 marks]
[5 *markah*]

ii. $y = Ax^2 + 7x$

[5 marks]
[5 *markah*]

CLO1 C3

(b) Solve and find a general solution to each the differential equations below:
Selesai dan cari persamaan am bagi persamaan pembezaan berikut:

i. $\frac{dy}{dx} = 2x + 1$

[3 marks]
[3 *markah*]

ii. $2\frac{dy}{dx} = \sin 2x$

[6 marks]
[6 *markah*]

iii. $\frac{dy}{dx} e^{-x} + e^{2x} = 0$

[6 marks]
[6 *markah*]

SECTION C: 25 MARKS

BAHAGIAN C: 25 MARKAH

INSTRUCTION:

Answer **ONE (1)** question from section **A** or **B** or any questions that have not answered yet.

ARAHAN :

*Jawab **SATU (1)** soalan dari bahagian **A** atau **B** atau mana-mana soalan yang belum dijawab.*

SOALAN TAMAT

FORMULA DBM3023- 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:	$y=Ae^{m_1x}+Be^{m_2x}$
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.	$\int_0^t f(u)du$	$\frac{F(s)}{s}$
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.	$\int sec^2(ax+b)\ dx = \frac{1}{\frac{d}{dx}(ax+b)} \times \tan(ax+b) + c$		