SULIT

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI DISEMBER 2015

DBM3023: ELECTRICAL ENGINEERING MATHEMATICS

TARIKH : 05 APRIL 2016
MASA : 8.30 AM – 10.30 AM (2 JAM)

Kertas ini mengandungi **ENAM BELAS (16)** halaman bercetak.
Bahagian A: Struktur (4 soalan)
Bahagian B: Struktur (2 soalan)
Dokumen sokongan yang disertakan : 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 struktur. Jawab **TIGA (3)** soalan sahaja.*

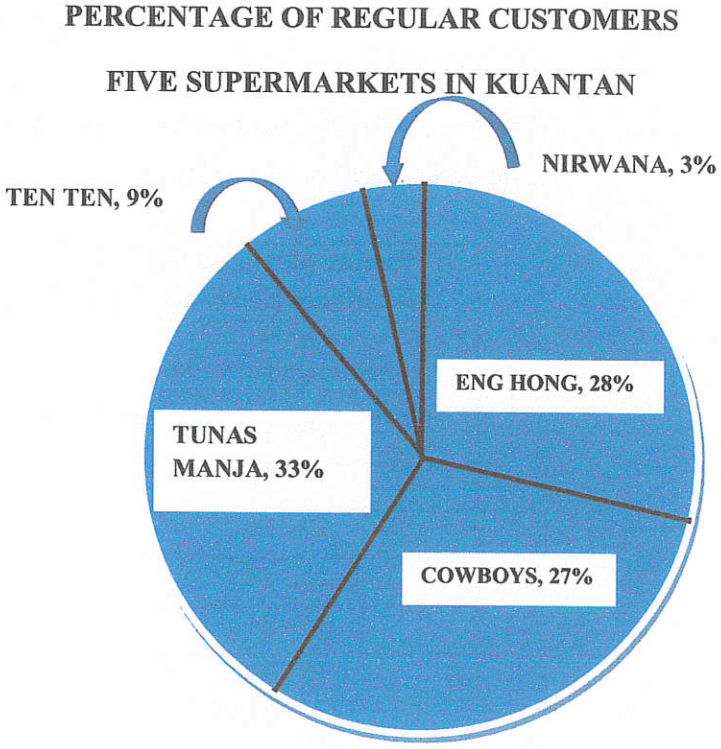
QUESTION 1

SOALAN 1

CLO2
C2

a) The pie chart below shows the percentage of regular customers for five supermarkets in Kuantan. A total of 200 people were involved in this study.

Carta pai di bawah menunjukkan peratusan pelanggan tetap bagi lima pasaraya di Kuantan. Sejumlah 200 orang telah terlibat bagi kajian ini.



Based on Table 1(b):

Berdasarkan Jadual 1(b):

Calculate the mean, mode and median.

Kirakan min, mod dan median .

[10 marks]
[10 *markah*]

CLO2
C3

b) i. The probability of an engine failures is given by: e_1=failure due to the overheating, e_2=failure due to the ignition problems, and e_3 = failure due to the fuel blockage. When $e_1 = \frac{1}{7}, e_2 = \frac{2}{9}, e_3 = \frac{3}{11}$, determine the probability of:

Kebarangkalian disebabkan kegagalan enjin: e_1 = kegagalan kerana terlalu panas, e_2 =kegagalan kerana masalah pencucuhan, dan e_3 =kegagalan disebabkan tersumbat bahan api. Apabila $e_1 = \frac{1}{7}, e_2 = \frac{2}{9}, e_3 = \frac{3}{11}$, tentukan kebarangkalian berikut:

1. Both e_1 and e_2 are happening

   Kedua-dua e_1 dan e_2 berlaku [3 marks]
   [*3 markah*]

2. Either e_2 or e_3 is happening

   Samada e_2 atau e_3 berlaku [3 marks]
   [*3 markah*]

3. Both e_1 and either e_2 or e_3 are happening

   Kedua-dua e_1 dan samada e_2 atau e_3 berlaku [4 marks]
   [*4 markah*]

CLO2
C3

ii. In a Mathematics class of 30 students, 19 students are boys and 11 students are girls. On a test, 4 boys and 5 girls get **A** grade. If a student is chosen randomly from the class, what is the probability to choose a girl or an **A** student?

Di dalam kelas matematik, terdapat 30 orang pelajar, 19 adalah lelaki dan 11 perempuan. Di dalam suatu ujian, 4 lelaki dan 5 perempuan mendapat gred A. Jika seorang pelajar dipilih secara rawak daripada kelas tersebut, apakah kebarangkalian untuk memilih seorang perempuan atau seorang pelajar mendapat gred A?

[5 marks]

[*5 markah*]

QUESTION 4
SOALAN 4

CLO2 C2

a) Find the Inverse Laplace Transform for each of the following functions:

Cari Jelmaan Laplace Songsang bagi setiap fungsi yang berikut:

i. $\dfrac{5}{4s-24}$ [3 marks]
[3 *markah*]

ii. $\dfrac{8}{s^2+16}$ [3 marks]
[3 *markah*]

iii. $\dfrac{2s+5}{s^2+25}$ [4 marks]
[4 *markah*]

CLO2 C3

b) Determine the Laplace Transform below by using Partial Fraction Method:

Tentukan Jelmaan Laplace di bawah dengan menggunakan Kaedah Pecahan Separa:

i. $\dfrac{s+10}{(s+3)(s-4)}$ [7 marks]
[*7 markah*]

ii. $\dfrac{s+4}{s^2-3s+2}$ [8 marks]
[*8 markah*]

CLO1
C3

b) Find the root of the equation $2x^2 - 3 = \frac{1}{x}$ with $x_0 = 1.5$ by using Fixed Point Iteration Method. Give the correct answer into three decimal places.

Dapatkan punca bagi persamaan $2x^2 - 3 = \frac{1}{x}$ *dengan* $x_0 = 1.5$ *dengan menggunakan Kaedah Lelaran Mudah. Berikan jawapan betul kepada 3 titik tempat perpuluhan.*

[15 marks]
[15 *markah*]

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	$\text{Median} = L + \left[\frac{\frac{N}{2} - F}{f_m}\right] C$	
Mode	$\text{Mode} = L_{Mo} + \left[\frac{d_1}{d_1 + d_2}\right] C$	
First Quartile	$Q_1 = L + \left[\frac{\frac{N}{4} - F}{f_m}\right] C$	
Third Quartile	$Q_3 = L + \left[\frac{\frac{3N}{4} - F}{f_m}\right] C$	
Decil	$D_k = L + \left[\frac{\frac{k}{10} N - F}{f_{DK}}\right] C$	
Percentile	$P_K = L + \left[\frac{\frac{k}{100} N - F}{f_{PK}}\right] C$	
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	$s = \sqrt{\text{var}\,iance}$	

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 $\frac{d^2y}{dt^2}, y''(t)$	$s^2Y(s)-sy(0)-y'(0)$

Differentation

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.	$\frac{d}{dx}(f(x)\pm g(x))=f'(x)\pm g'(x)$
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]*

SOLUTION FOR 1st ORDER DIFFERENTIAL EQUATION

Homogeneous Equations

- Substitution

$$y = vx \quad \text{and} \quad \frac{dy}{dx} = v + x\frac{dy}{dx}$$

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: $y = e^{\alpha x}(A\cos\beta x + B\sin\beta x)$