

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)

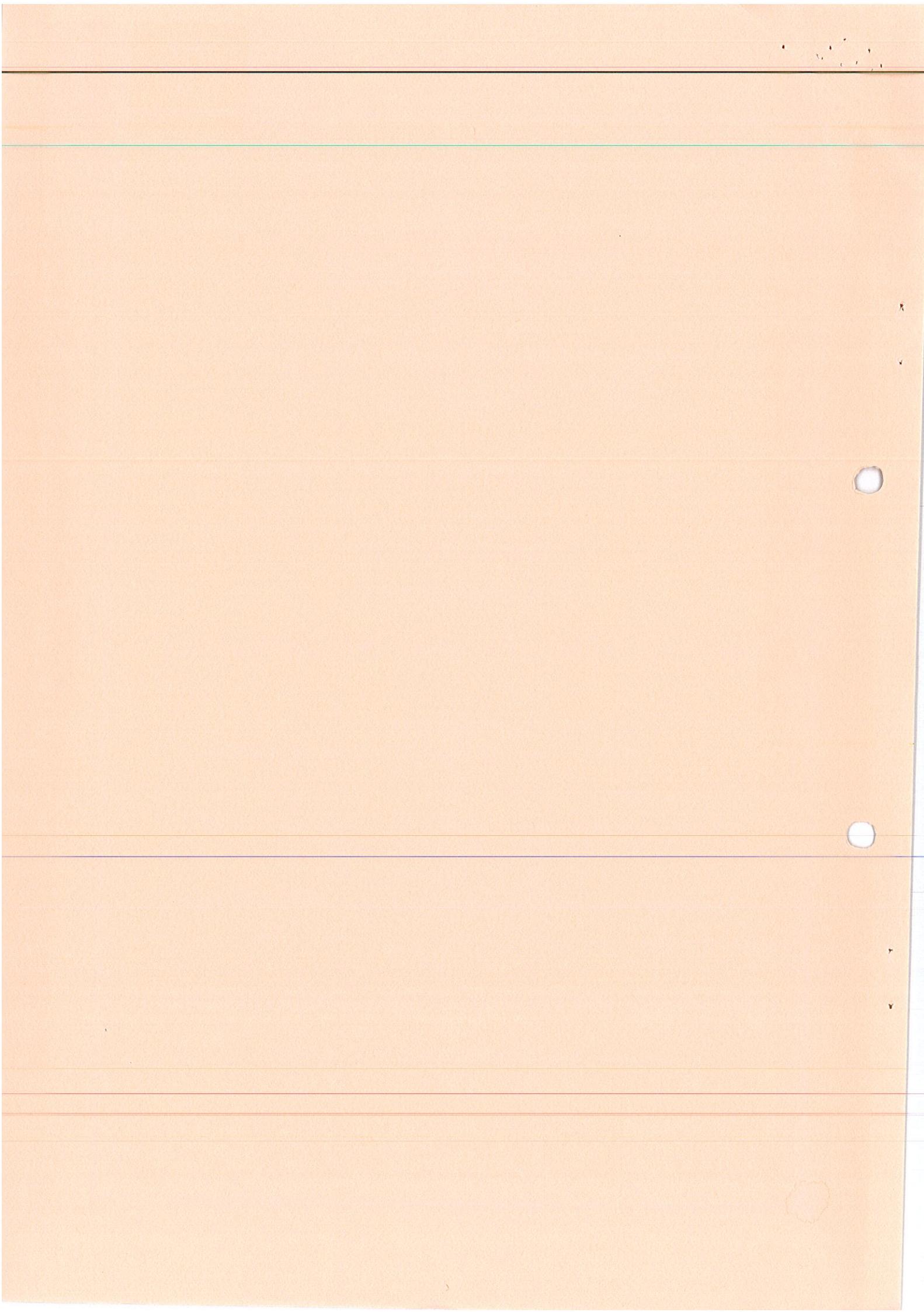
Bahagian B: Struktur (2 soalan)

Dokumen sokongan yang disertakan : Kertas Graf dan Formula

JANGAN BUKA KERTAS SOALANINI 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 **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 <i>Item</i>	Percentage of expenses <i>Peratus Perbelanjaan</i>
Printing <i>Percetakan</i>	25%
Transportation <i>Pengangkutan</i>	15%
Paper <i>Kertas</i>	30%
Binding <i>Penjilidan</i>	20%
Promotion <i>Promosi</i>	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

- (b) Table 1(b) shows the typing speed for 120 secretarial students.

C3

Jadual 1(b) menunjukkan kelajuan menaip bagi 120 orang pelajar kesetiausahaannya.

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 are 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

$$\text{definition } F(s) = \int_0^{\infty} e^{-st} f(t) dt.$$

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

[2 marks]

[2 markah]

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

[3 marks]

[3 markah]

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

[5 marks]

[5 markah]

CLO2
C3 (b)

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

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

[6 marks]

[6 markah]

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

Selesaikan persamaan pembezaan $\frac{dy}{dt} + 3y = e^{-4t}$. 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]

QUESTION 6***SOALAN 6***CLO1
C2

- (a) Determine a differential equation for each of the following functions

Tentukan persamaan pembezaan bagi setiap fungsi yang berikut:

i. $y = Ae^{x^3}$

[2 marks]

[2 markah]

ii. $3y^2 \frac{dy}{dx} = 4x^3$

[4 marks]

[4 markah]

iii. $e^{2x} \frac{dy}{dx} = 3y^2$

[4 marks]

[4 markah]

CLO1
C3

- (b) Solve the following differential equations below:

Selesaikan persamaan pembezaan berikut:

i. $\frac{d^2y}{dx^2} + 7\frac{dy}{dx} + 10y = 0$

[4 marks]

[4 markah]

ii. $4\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + y = 0$

[4 marks]

[4 markah]

iii. $2\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 3y = 0$

[7 marks]

[7 markah]

SOALAN TAMAT

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	$\text{Median} = L_m + \left[\frac{\frac{N}{2} - F}{f_m} \right] C$	
Mode	$\text{Mode} = L_{Mo} + \left[\frac{d_1}{d_1 + d_2} \right] C$	
Quartile	$Q_k = L_{Q_k} + \left[\frac{\frac{kN}{4} - F}{f_{Q_k}} \right] C \quad ; k = 1, 2, 3$	
Decile	$D_k = L_{D_k} + \left[\frac{\frac{10k}{10} - F}{f_{D_k}} \right] C \quad ; k = 1, 2, 3, \dots, 9$	
Percentile	$P_k = L_{P_k} + \left[\frac{\frac{100k}{100} - F}{f_{P_k}} \right] C \quad ; k = 1, 2, 3, \dots, 99$	
Mean Deviation	$E = \frac{\sum x - \bar{x} }{n}$	$E = \frac{\sum (x - \bar{x} f)}{\sum f}$
Variance	$s^2 = \frac{\sum (x - \bar{x})^2}{n}$	$s^2 = \frac{\sum x_i^2 - n\bar{x}^2}{n}$
	$s^2 = \frac{\sum [(x - \bar{x})^2 f]}{\sum f}$	$s^2 = \frac{\sum fx^2}{\sum f} - \left[\frac{\sum fx}{\sum f} \right]^2$
Standard Deviation	$s = \sqrt{\text{variance}}$	

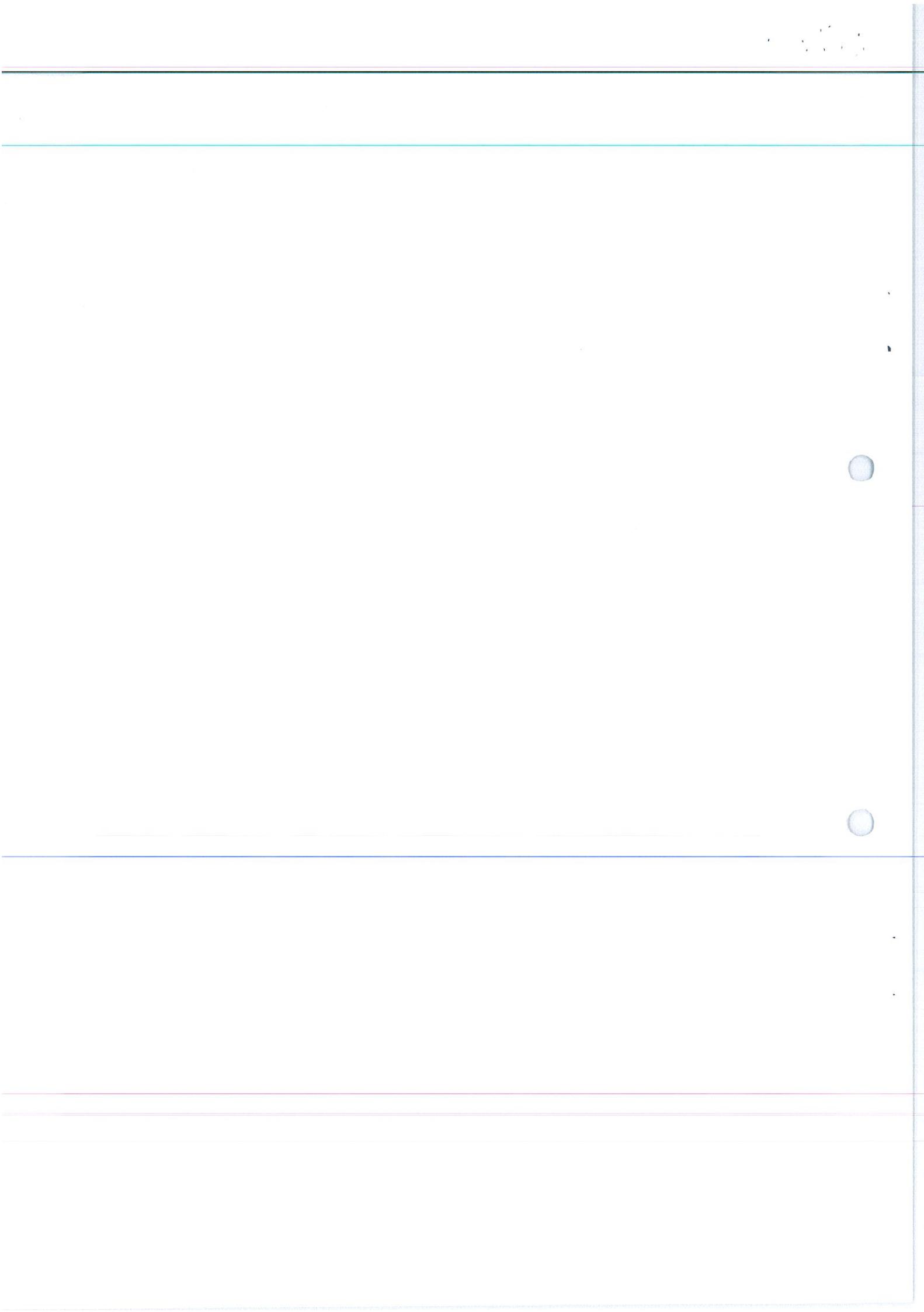


NUMERICAL METHOD		
Crout Method	$A = \begin{pmatrix} l_{11} & 0 & 0 \\ l_{21} & l_{22} & 0 \\ l_{31} & l_{32} & l_{33} \end{pmatrix} \begin{pmatrix} 1 & u_{12} & u_{13} \\ 0 & 1 & u_{23} \\ 0 & 0 & 1 \end{pmatrix}$	
Doolittle Method	$A = \begin{pmatrix} 1 & 0 & 0 \\ l_{21} & 1 & 0 \\ l_{31} & l_{32} & 1 \end{pmatrix} \begin{pmatrix} u_{11} & u_{12} & u_{13} \\ 0 & u_{22} & u_{23} \\ 0 & 0 & u_{33} \end{pmatrix}$	
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	
$E = pn$	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
$P(B A) = \frac{P(B \cap A)}{P(A)}$	$P(A \cap B) = P(A) \cdot P(B)$
	$P(A \cap B) = P(A) \cdot P(B A)$

SOLUTION FOR 1 st ORDER DIFFERENTIAL EQUATION	
Homogeneous Equation $y = vx$ and $\frac{dy}{dx} = v + x\frac{dv}{dx}$	<p>Linear Factors (Integrating Factors) $y \bullet IF = \int Q \bullet IF dx$ Where $IF = e^{\int P dx}$</p> <p>Logarithmic $a = e^{\ln a}$ $a^x = e^{x \ln a}$ $\int a^x dx = \frac{a^x}{\ln a} + c$</p>

GENERAL SOLUTION FOR 2 nd 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.	$f(t)$	$F(s)$		$f(t)$	$F(s)$
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.	$t^n \cdot e^{at}, n=1,2,3$	$\frac{n!}{(s-a)^{n+1}}$	19.	$e^{-at} \cosh \omega t$	$\frac{s+a}{(s+a)^2 - \omega^2}$
8.	$t^n \cdot f(t)$	$(-1)^n \frac{d^n}{ds^n} [F(s)]$	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 $\frac{d^2 y}{dt^2}, y''(t)$	$s^2 Y(s) - sy(0) - y'(0)$



DIFFERENTIATION			
1. $\frac{d}{dx}(k) = 0, k \text{ is constant}$	2. $\frac{d}{dx}(x^n) = nx^{n-1} \text{ [Power Rule]}$		
3. $\frac{d}{dx}(ax^n) = anx^{n-1}$	4. $\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$		
5. $\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx} \text{ [Product Rule]}$	6. $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2} \text{ [Quotient Rule]}$		
7. $\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du} \text{ [Chain Rule]}$	8. $\frac{d}{dx}(e^x) = e^x$		
9. $\frac{d}{dx}(e^{ax+b}) = e^{ax+b} \times \frac{d}{dx}(ax+b)$	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. $\int \sin(ax+b) dx = -\frac{1}{a} \times \cos(ax+b) + c$			
13. $\int \cos(ax+b) dx = \frac{1}{a} \times \sin(ax+b) + c$			
14. $\int \sec^2(ax+b) dx = \frac{1}{a} \times \tan(ax+b) + c$			

