

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENGAJIAN TINGGI**

JABATAN MATEMATIK, SAINS & KOMPUTER

PENILAIAN ALTERNATIF

SESI 1 : 2021/2022

DBM3013 : ENGINEERING MATHEMATICS 3

NAMA PENYELARAS KURSUS : RABIATUL ADAWIYAH BINTI ROSLI

KAEDAH PENILAIAN : PEPERIKSAAN ONLINE

**JENIS PENILAIAN : SOALAN ESEI BERSTRUKTUR
(2 SOALAN)**

TARIKH PENILAIAN : 25/01/2022

TEMPOH PENILAIAN : 1 JAM

LARANGAN TERHADAP PLAGIARISM (AKTA 174)

**PELAJAR TIDAK BOLEH MEMPLAGIAT APA-APA IDEA, PENULISAN, DATA
ATAU CIPTAAN ORANG LAIN. PLAGIAT ADALAH SALAH SATU
PENYELEWENGAN AKADEMIK. SEKIRANYA PELAJAR DIBUKTIKAN
MELAKUKAN PLAGIARISM, PENILAIAN BAGI KURSUS BERKENAAN AKAN
DIMANSUHKAN DAN DIBERI GRED F DENGAN NILAI MATA 0.**

**(RUJUK BUKU ARAHAN-ARAHAN PEPERIKSAAN DAN KAEDAH PENILAIAN (Diploma) EDISI 6, JUN 2019,
KLAUSA 17.3)**

INSTRUCTION:

This section consists of **TWO (2)** subjective question. Write your answers in the answer sheet.

ARAHAN :

Bahagian ini mengandungi DUA (2) soalan subjektif. Tulis jawapan anda di dalam helaian kertas.

QUESTION 1CLO1
C2

- (a) Express the following in a differential equation form:

Dapatkan bentuk persamaan pembezaan bagi fungsi berikut:

(i) $y = Ax^2 + 4$

[2 marks]
[2 markah]

(ii) $y = A \cos (B + 5x)$

[3 marks]
[3 markah]CLO1
C3

- (b) Solve the following differential equations:

Selesaikan persamaan pembezaan berikut:

(i) $\frac{dy}{dx} = e^{\frac{x-y}{2}}$

[3 marks]
[3 markah]

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

[7 marks]
[7 markah]CLO1
C3

- (c) Solve the following differential equations:

Selesaikan persamaan pembezaan biasa berikut:

(i) $y'' - 8y' + 16y = 0$

[3 marks]
[3 markah]

(ii) $\frac{d^2y}{dx^2} + 25y = 0$

[3 marks]
[3 markah]

(iii) $y'' - 4y' + 13y = 0$

[4 marks]
[4 markah]

QUESTION 2

SOALAN 2

CLO1
C2

- a) Luqman has RM354 and he wants to buy a rope to sell in his store. The length of white rope is at most 4 times than the length of red rope. The total length of the rope is not less than 35metre. The price of 1metre white rope is RM3.50 and the price of 1 metre of red rope is RM4.75.

Luqman mempunyai RM354 dan dia ingin membeli tali untuk dijual di kedainya. Panjang tali putih adalah paling banyak 4 kali ganda berbanding tali merah. Jumlah panjang tali tersebut tidak kurang daripada 35 meter. Harga bagi 1meter tali putih adalah RM3.50 dan 1meter tali merah pula RM4.75.

- (i) Express the three inequalities other than $x \geq 0$ and $y \geq 0$ that satisfy all the above constraints : [3 marks]

Tuliskan tiga ketaksamaan selain $x \geq 0$ dan $y \geq 0$ yang memenuhi semua kekangan di atas [3 markah]

- (ii) Express the objective function to maximize the profit if Luqman get profit RM 0.50 from white rope and RM0.65 from red rope so that he can gain maximum profit. [2 marks]

Ungkapkan fungsi objektif untuk memaksimumkan keuntungan sekiranya Luqman memperoleh keuntungan sebanyak RM0.50 dari jualan tali putih dan RM0.65 dari jualan tali merah. [2 markah]

CLO1
C3

- b) (i) By using graph, draw and shade the feasible region which fulfill the given condition. **[5 marks]**

Dengan menggunakan graf, lukis dan lorekkan kawasan yang memenuhi ketidaksamaan berikut. **[5 markah]**

$$P = 175x + 364y$$

$$y \geq x - 275$$

$$x + y \leq 535$$

$$y \leq 150$$

$$x \geq 0, y \geq 0$$

- (ii) Based on the graph, calculate the maximum value given that the objective function is **[5 marks]**

Berdasarkan graf yang dibina, kirakan nilai maksimum, diberi fungsi objektif

[5 markah]

$$\text{Maximize } P = 175x + 364y$$

CLO1
C3

- c) Solve the following by using Simplex Method:

Selesaikan yang berikut menggunakan Kaedah Simplex:

$$\text{Maximize } P = 15x + 25y$$

subject to

$$2x + 3y \leq 150$$

$$3x + 4y \leq 275$$

$$x \leq 55$$

$$y \leq 35$$

[10 marks]

[10 markah]

SOALAN TAMAT

FORMULA DBM3013 (ENGINEERING MATHEMATICS 3)

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

SOLUTION FOR 1 st ORDER DIFFERENTIAL EQUATION	
Homogeneous Equation $y = vx$ and $\frac{dy}{dx} = v + x \frac{dv}{dx}$	Linear Factors (Integrating Factors) $y \cdot IF = \int Q \cdot IF dx$ 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 2 nd ORDER DIFFERENTIAL EQUATION	
Equation of the form $a \frac{d^2 y}{dx^2} + b \frac{dy}{dx} + cy = 0$	
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:	$y = e^{\alpha x}(A \cos \beta x + B \sin \beta x)$

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]
7. $\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du}$ [Chain Rule]	8. $\frac{d}{dx}(e^x) = e^x$
9. $\frac{d}{dx}(e^{ax+b}) = e^{ax+b} \times \frac{d}{dx}(ax+b)$	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. $\int \sin(ax+b) dx = -\frac{1}{\frac{d}{dx}(ax+b)} \times \cos(ax+b) + c$	
13. $\int \cos(ax+b) dx = \frac{1}{\frac{d}{dx}(ax+b)} \times \sin(ax+b) + c$	
14. $\int \sec^2(ax+b) dx = \frac{1}{\frac{d}{dx}(ax+b)} \times \tan(ax+b) + c$	