**SULIT**

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

JABATAN MATEMATIK, SAINS & KOMPUTER

PENILAIAN ALTERNATIF

**SESI 1 : 2021/2022**

# DBM30033 : ENGINEERING MATHEMATICS 3

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**NAMA PENYELARAS KURSUS : RABIATUL ADAWIYAH BINTI ROSLI**

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|---|---|
| **KAEDAH PENILAIAN** | **: PEPERIKSAAN ONLINE** |
| **JENIS PENILAIAN** | **: SOALAN ESEI BERSTRUKTUR (2 SOALAN)** |
| **TARIKH PENILAIAN** | **: 25/01/2022** |
| **TEMPOH PENILAIAN** | **: 1 JAM** |

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**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 1**

CLO1 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 35*metre*. The price of 1*metre* 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 memaksimakan 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*]**

$$P = 175x + 364y$$
$$y \geq \mathrm{x} - 275$$
$$x + y \leq 535$$
$$y \leq 150$$
$$x \geq 0, y \geq 0$$

(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*]**

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

CLO1
C3

c) Solve the following by using Simplex Method:

*Selesaikan yang berikut menggunakan Kaedah Simplex:*

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 DBM30033 (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 1st ORDER DIFFERENTIAL EQUATION | |
|---|---|
| Homogeneous Equation<br>$y=vx$ and $\frac{dy}{dx}=v+x\frac{dv}{dx}$ | Linear Factors (Integrating Factors)<br>$y \bullet IF=\int Q \bullet IF\,dx$<br>Where $IF=e^{\int P dx}$ |
| | Logarithmic<br>$a = e^{\ln a}$<br>$a^x = e^{x\ln a}$<br>$\int a^x dx = \frac{a^x}{\ln a}+c$ |

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

| 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. | $\int ax^n dx = \frac{ax^{n+1}}{n+1} + c \quad ; \{n \neq -1\}$ | 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. | $\int sec^2(ax+b) \; dx = \frac{1}{\frac{d}{dx}(ax+b)} \times \tan(ax+b) + c$ | | |