INSTRUCTION:
Answer **ONE (1)** question from each section (A, B and C) and answer **ONE (1)** question from any section that has not been answered.

ARAHAN :
*Jawab **SATU (1)** soalan daripada setiap bahagian (A, B dan C) dan Jawab **SATU(1)** lagi soalan yang belum dijawab dari mana-mana bahagian.*

SECTION A
BAHAGIAN A

QUESTION 1
SOALAN 1

(a) By using definition of Hyperbolic Functions, find the value of
Dengan menggunakan definisi Fungsi Hiperbola, cari nilai bagi

CLO1 C1 i. sinh (2.75)

[2 marks]
[*2 markah*]

CLO1 C1 ii. cosh (0.85)

[2 marks]
[*2 markah*]

CLO1 C2 iii. $\operatorname{sech}(\ln 7)$

[3 marks]
[*3 markah*]

CLO1 C2 (b) Complete the table below for equation $y = \cosh\left(\frac{x}{2}\right)$. Then plot the graph for the range given as $-3 \le x \le 3$.

Lengkapkan jadual di bawah bagi persamaan $y = \kosh\left(\frac{x}{2}\right)$. *Seterusnya, plot graf bagi julat* $-3 \le x \le 3$.

[8 marks]
[*8 markah*]

x	-3	-2	-1	0	1	2	3
y							

SULIT

POLITEKNIK
Jabatan Pengajian Politeknik

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENGAJIAN POLITEKNIK
KEMENTERIAN PENGAJIAN TINGGI

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI DISEMBER 2012

BA601 : ENGINEERING MATHEMATICS 5

TARIKH : 29 APRIL 2013 (ISNIN)
TEMPOH : 2 JAM (2.30 P.M-4.30 P.M)

Kertas ini mengandungi **TUJUH (7)** halaman bercetak.
Bahagian A: Struktur (2 soalan) – Jawab **SATU (1)** Soalan sahaja
Bahagian B: Struktur (2 soalan) – Jawab **SATU (1)** Soalan sahaja
Bahagian C: Struktur (2 soalan) – Jawab **SATU (1)** Soalan sahaja
DAN Jawab **SATU (1)** Soalan Dari Mana-mana Bahagian A/ B/ C

Dokumen sokongan yang disertakan : FORMULA

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION B
BAHAGIAN B

QUESTION 3
SOALAN 3

CLO2 C2 (a) Differentiate the following functions with respect to x.

Bezakan fungsi yang berikut terhadap x.

i. $y = \text{sech}(5-2x)$

[2 marks]
[*2 markah*]

ii. $y = \frac{3}{5}\cosh^5(3x+1)$

[3 marks]
[*3 markah*]

iii. $y = 2\sqrt{x}\cot^{-1}x$

[4 marks]
[*4 markah*]

iv. $y = \text{cosech}^{-1}\left(\tan\frac{x}{4}\right)$

[5 marks]
[*5 markah*]

CLO2 C1 (b) Given $x^2 + y^2 = 9xy$, evaluate $\frac{dy}{dx}$ when $x = 4, y = 2$.

Diberi $x^2 + y^2 = 9xy$, *nilaikan* $\frac{dy}{dx}$ *apabila* $x = 4, y = 2$.

[4 marks]
[*4 markah*]

CLO2 C3 (c) The power P, consumed in a resistor is given by $P = \frac{V^2}{R}$ watts. Determine the approximate change in power when V increases by 5% and R decreases by 0.5% if the original values of V and R are 50 volts and 12.5 ohms respectively.

Kuasa, P yang digunakan di dalam satu perintang diberikan oleh rumus $P = \frac{V^2}{R}$ *watt. Tentukan anggaran perubahan kuasa apabila V bertambah sebanyak 5% dan R berkurang 0.5% jika nilai asal V ialah 50 volts dan R 12.5 ohms.*

[7 marks]
[*7 markah*]

CLO1 C2 (c) If $y^2 = 1.5x\tanh 0.5x$, find the value of y when $x = 2$.
Jika $y^2 = 1.5x\tanh 0.5x$, *cari nilai bagi y apabila* $x = 2$.

[4 marks]
[*4 markah*]

CLO1 C3 (d) Prove that $\coth^2 x - 1 = \text{cosech}^2 x$.
Buktikan bahawa $\coth^2 x - 1 = \text{cosech}^2 x$.

[6 marks]
[*6 markah*]

QUESTION 2
SOALAN 2

CLO1 C1 (a) Determine the value of the following inverse hyperbolic functions.
Tentukan nilai bagi fungsi hiperbola songsang berikut.

i. $\sinh^{-1}(0.8652)$

[2 marks]
[*2 markah*]

ii. $\tanh^{-1}(0.6295)$

[3 marks]
[*3 markah*]

CLO1 C3 (b) Prove that $\text{sech}^2 x = 1 - \tanh^2 x$.
Buktikan bahawa. $\text{sech}^2 x = 1 - \tanh^2 x$

[9 marks]
[*9 markah*]

CLO1 C2 (c) Determine the principal value of the following functions.
Tentukan nilai principal bagi fungs-fungsi berikut.

i. $\sin^{-1}\left(\sqrt[3]{0.79}\right)$

[4 marks]
[*4 markah*]

ii. $\cot^{-1}(\ln 2.751)$

[5 marks]
[*5 markah*]

CLO1 C1 (d) Solve the following equation.
Selesaikan persamaan berikut.

$\tan^{-1}(4y) = \left(\frac{\pi}{7}\right)$

[2 marks]
[*2 markah*]

SECTION C
BAHAGIAN C

QUESTION 5
SOALAN 5

CLO3 C2 (a) Form the differential equation for $y = Ax^2 - Bx + x$

Bentukkan persamaan pembezaan bagi $y = Ax^2 - Bx + x$

[8 marks]
[*8 markah*]

CLO3 C4 (b) Solve the following first order differential equations.

Selesaikan persamaan pembezaan peringkat pertama berikut.

i. $e^x \frac{dy}{dx} = 9$, given $y = 5$ and $x = 0$

[4 marks]
[*4markah*]

ii. $x\frac{dy}{dx} = -3x^{-3} - 6$

[3 marks]
[*3markah*]

iii. $\frac{dy}{dx} = \frac{y+7}{\cos^2 x}$

[3 marks]
[*3markah*]

iv. $x\frac{dy}{dx} - y = x$

[7 marks]
[*7markah*]

QUESTION 4
SOALAN 4

CLO2 C2 (a) Determine the following integrals.

Tentukan setiap kamiran berikut.

i. $\int \frac{e^x}{\sqrt{e^{2x} - 16}} dx$

[4 marks]
[*4 markah*]

ii. $\int \frac{2}{x^2 - 2x + 2} dx$

[5 marks]
[*5markah*]

iii. $\int \sinh^3(2x+1)\cosh(2x+1)dx$

[5 marks]
[*5 markah*]

CLO2 C3 (b) Determine the following function using **Integration by Partial Fractions Method.**

Tentukan fungsi berikut dengan menggunakan ***Kaedah Kamiran Pecahan Separa.***

$\int \frac{x+2}{x^2 - 3x + 2} dx$

[6 marks]
[*6 markah*]

CLO2 C3 (c) Determine the following function using **Integration by Parts Method.**

Tentukan fungsi berikut dengan menggunakan ***Kaedah Kamiran Bahagian Demi Bahagian.***

$\int x^2 \ln 5x dx$

[5 marks]
[*5 markah*]

FORMULA: BA601 ENGINEERING MATHEMATICS 5

DIFFERENTIATION	INTEGRATION
$\frac{d}{dx}(k) = 0;\ k = \text{constant}$	$\int k\,dx = kx + C\,;\ k = \text{constant}$
$\frac{d}{dx}(x^n) = nx^{n-1}$	$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C\,;\ n \neq -1$
$\frac{d}{dx}(\ln\lvert x\rvert) = \frac{1}{x}$	$\int \frac{1}{x}\,dx = \ln\lvert x\rvert + C$
$\frac{d}{dx}(e^x) = e^x$	$\int e^x dx = e^x + C$
$\frac{d}{dx}(\cos x) = -\sin x$	$\int \sin x\,dx = -\cos x + C$
$\frac{d}{dx}(\sin x) = \cos x$	$\int \cos x\,dx = \sin x + C$
$\frac{d}{dx}(\tan x) = \sec^2 x$	$\int \sec^2 x\,dx = \tan x + C$
$\frac{d}{dx}(\cot x) = -\operatorname{cosec}^2 x$	$\int \operatorname{cosec}^2 x\,dx = -\cot x + C$
$\frac{d}{dx}(\sec x) = \sec x \tan x$	$\int \sec x \tan x\,dx = \sec x + C$
$\frac{d}{dx}(\operatorname{cosec} x) = -\operatorname{cosec} x \cot x$	$\int \operatorname{cosec} x \cot x\,dx = -\operatorname{cosec} x + C$
$\frac{d}{dx}(\cosh x) = \sinh x$	$\int \sinh x\,dx = \cosh x + C$
$\frac{d}{dx}(\sinh x) = \cosh x$	$\int \cosh x\,dx = \sinh x + C$
$\frac{d}{dx}(\tanh x) = \operatorname{sech}^2 x$	$\int \operatorname{sech}^2 x\,dx = \tanh x + C$
$\frac{d}{dx}(\coth x) = -\operatorname{cosech}^2 x$	$\int \operatorname{cosech}^2 x\,dx = -\coth x + C$
$\frac{d}{dx}(\operatorname{sech} x) = -\operatorname{sech} x \tanh x$	$\int \operatorname{sech} x \tanh x\,dx = -\operatorname{sech} x + C$
$\frac{d}{dx}(\operatorname{cosech} x)\,dx = -\operatorname{cosech} x \coth x$	$\int \operatorname{cosech} x \coth x\,dx = -\operatorname{cosech} x + C$

TRIGONOMETRIC IDENTITIES	HYPERBOLIC IDENTITIES
$\cos^2 x + \sin^2 x = 1$	$\cosh^2 x - \sinh^2 x = 1$
$1 + \tan^2 x = \sec^2 x$	$1 - \tanh^2 x = \operatorname{sech}^2 x$
$\cot^2 x + 1 = \operatorname{cosec}^2 x$	$\coth^2 x - 1 = \operatorname{cosech}^2 x$
$\sin 2x = 2 \sin x \cos x$	$\sinh 2x = 2 \sinh x \cosh x$
$\cos 2x = \cos^2 x - \sin^2 x$	$\cosh 2x = \cosh^2 x + \sinh^2 x$
$= 2\cos^2 x - 1$	$= 2\cosh^2 x - 1$
$= 1 - 2\sin^2 x$	$= 1 + 2\sinh^2 x$
$\tan 2x = \frac{2\tan x}{1 - \tan^2 x}$	$\tanh 2x = \frac{2\tanh x}{1 + \tanh^2 x}$

QUESTION 6

SOALAN 6

CLO3 C4

(a) Solve the following differential equation.
Selesaikan persamaan pembezaan berikut.

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

[13 marks]
[*13 markah*]

ii. $\frac{dy}{dx} - 5y = e^{3x}$

[7 marks]
[*7 markah*]

CLO3 C2

a) Solve the second order differential equation below.
Selesaikan persamaan pembezaan peringkat kedua di bawah.

$$\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$$

[5 marks]
[*5 markah*]

SOALAN TAMAT

FORMULA: BA601 ENGINEERING MATHEMATICS 5

DIFFERENTIAL EQUATION

Equations of the form $\frac{d^2y}{dx^2}+b\frac{dy}{dx}+cy=0$

1. Real and different roots

   $y = Ae^{m_1x} + Be^{m_2x}$

2. Real and equal roots

   $y = e^{m_1x}(A+Bx)$

3. Complex roots

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

Equation of the form $\frac{d^2y}{dx^2}\pm n^2y=0$

1. $\frac{d^2y}{dx^2}+n^2y=0$

   $y = A\cos nx + B\sin nx$

2. $\frac{d^2y}{dx^2}-n^2y=0$

   $y = A\cosh nx + B\sinh nx$

LOGARITHMIC

$$a^x = e^{x\ln a}$$

$$\int a^x dx = \frac{a^x}{\ln a}+C$$

FORMULA: BA601 ENGINEERING MATHEMATICS 5

HYPERBOLIC FUNCTIONS

$$\sinh x = \frac{e^x-e^{-x}}{2}$$

$$\cosh x = \frac{e^x+e^{-x}}{2}$$

$$\tanh x = \frac{e^x-e^{-x}}{e^x+e^{-x}}$$

$$\coth x = \frac{e^x+e^{-x}}{e^x-e^{-x}};\ x\neq 0$$

$$\operatorname{sech} x = \frac{2}{e^x+e^{-x}}$$

$$\operatorname{cosec} h\, x = \frac{2}{e^x-e^{-x}};\ x\neq 0$$

INVERSE HYPERBOLIC FUNCTIONS

$$\sinh^{-1} x = \ln\left(x+\sqrt{x^2+1}\right);\ -\infty<x<\infty$$

$$\cosh^{-1} x = \ln\left(x+\sqrt{x^2-1}\right);\ x\geq 1$$

$$\tanh^{-1} x = \frac{1}{2}\ln\left(\frac{1+x}{1-x}\right);\ |x|<1$$

$$\coth^{-1} x = \frac{1}{2}\ln\left(\frac{x+1}{x-1}\right);\ |x|>1$$

$$\operatorname{sech}^{-1} x = \ln\left(\frac{1+\sqrt{1-x^2}}{x}\right);\ 0<x\leq 1$$

$$\operatorname{cosech}^{-1} x = \ln\left(\frac{1}{x}+\frac{\sqrt{1+x^2}}{|x|}\right);\ x\neq 0$$

DIFFERENTIATION OF INVERSE FUNCTIONS

$$\frac{d}{dx}\left(\sin^{-1}u\right) = \frac{1}{\sqrt{1-u^2}}\frac{du}{dx},\ |u|<1$$

$$\frac{d}{dx}\left(\cos^{-1}u\right) = -\frac{1}{\sqrt{1-u^2}}\frac{du}{dx},\ |u|<1$$

$$\frac{d}{dx}\left(\tan^{-1}u\right) = \frac{1}{1+u^2}\frac{du}{dx}$$

$$\frac{d}{dx}\left(\cot^{-1}u\right) = -\frac{1}{1+u^2}\frac{du}{dx}$$

$$\frac{d}{dx}\left(\sec^{-1}u\right) = \frac{1}{|u|\sqrt{u^2-1}}\frac{du}{dx},\ |u|>1$$

$$\frac{d}{dx}\left(\operatorname{cosec}^{-1}u\right) = -\frac{1}{|u|\sqrt{u^2-1}}\frac{du}{dx},\ |u|>1$$

INTEGRATION OF INVERSE FUNCTIONS

$$\int\frac{1}{\sqrt{a^2-u^2}}du = \sin^{-1}\frac{u}{a}+C,\ |u|<a$$

$$\int-\frac{1}{\sqrt{a^2-u^2}}du = \cos^{-1}\frac{u}{a}+C,\ |u|<a$$

$$\int\frac{1}{a^2+u^2}du = \frac{1}{a}\tan^{-1}\frac{u}{a}+C$$

$$\int-\frac{1}{a^2+u^2}du = \frac{1}{a}\cot^{-1}\frac{u}{a}+C$$

$$\int\frac{1}{|u|\sqrt{u^2-a^2}}du = \frac{1}{a}\sec^{-1}\frac{u}{a}+C,\ |u|>a$$

$$\int-\frac{1}{|u|\sqrt{u^2-a^2}}du = \frac{1}{a}\operatorname{cosec}^{-1}\frac{u}{a}+C,\ |u|>a$$

$$\frac{d}{dx}\left(\sinh^{-1}u\right) = \frac{1}{\sqrt{u^2+1}}\frac{du}{dx}$$

$$\frac{d}{dx}\left(\cosh^{-1}u\right) = \frac{1}{\sqrt{u^2-1}}\frac{du}{dx},\ |u|>1$$

$$\frac{d}{dx}\left(\tanh^{-1}u\right) = \frac{1}{1-u^2}\frac{du}{dx},\ |u|<1$$

$$\frac{d}{dx}\left(\coth^{-1}u\right) = -\frac{1}{1-u^2}\frac{du}{dx},\ |u|>1$$

$$\frac{d}{dx}\left(\operatorname{sech}^{-1}u\right) = -\frac{1}{u\sqrt{1-u^2}}\frac{du}{dx},\ 0<u<1$$

$$\frac{d}{dx}\left(\operatorname{cosech}^{-1}u\right) = -\frac{1}{|u|\sqrt{1+u^2}}\frac{du}{dx},\ u\neq 0$$

$$\int\frac{1}{\sqrt{a^2+u^2}}du = \sinh^{-1}\frac{u}{a}+C,\ a>0$$

$$\int\frac{1}{\sqrt{u^2-a^2}}du = \cosh^{-1}\frac{u}{a}+C,\ u>a$$

$$\int\frac{1}{a^2-u^2}du = \frac{1}{a}\tanh^{-1}\frac{u}{a}+C;\ |u|<a$$

$$\int\frac{1}{u^2-a^2}du = \frac{1}{a}\coth^{-1}\frac{u}{a}+C;\ |u|>a$$

$$\int\frac{1}{u\sqrt{a^2-u^2}}du = -\frac{1}{a}\operatorname{sech}^{-1}\frac{u}{a}+C$$

$$\int\frac{1}{u\sqrt{a^2+u^2}}du = -\frac{1}{a}\operatorname{cosech}^{-1}\frac{u}{a}+C$$