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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2013/2014**

COURSE NAME : MATHEMATIC ENGINEERING I
COURSE CODE : BFC13903
PROGRAMME : 1 BFF
EXAMINATION DATE : JUNE 2014
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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- Q1** (a) Find the values of constant A and B, such that the following function $f(x)$ will be continuous for all values of x .
(8 marks)

$$f(x) = \begin{cases} 5, & x < 2 \\ x^2 + B, & 2 \leq x < 3 \\ x = \frac{x^2 - Ax - 6}{x - 2}, & x \geq 3 \end{cases}$$

- (b) Evaluate $\lim_{x \rightarrow 0} x \csc x$
(3 marks)

- (c) Evaluate $\lim_{x \rightarrow \infty} \left(1 - \frac{7}{x}\right)^x$
(9 marks)

- Q2** (a) Find the arc length of the curve $y = \sin^2 t$ and $x = \cos^2 t$ from $t = 0$ to $t = \pi/4$
(9 marks)

- (b) Find the derivative of $\tanh^{-1}(2x^2 + 1)$
(5 marks)

- (c) Evaluate the integral $\int_2^6 \frac{10}{25 - 9x + x^2} dx$. Write your answer to four decimal places. (Hint : complete the square)
(6 marks)

- Q3** (a) Use the given substitution to evaluate the indicated integral.

$$\int x^2 \sqrt{x^3 + 5} \, dx \quad ; \quad u = x^3 + 5$$

(6 marks)

- (b) Use a trigonometric identity to evaluate the integral

$$\int \sin 5x \cos x \, dx$$

(4 marks)

- (c) By using the substitution $t = \tan \frac{x}{2}$, evaluate the integral $\int \frac{dx}{1 - \sin x + \cos x}$.

(10 marks)

- Q4** (a) Find $\frac{dy}{dx}$ if $y = \frac{\sqrt{x^2-1}}{x}$. Simplify your answer

(5 marks)

- (b) Find $\frac{dy}{dx}$ for the implicit $x^m y^n = 2$ where m and n are constant

(5 marks)

- (c) Given $x = \cos 2t$ and $y = \sin 2t$. Find the value of $\frac{dy}{dx}$ when $t = \pi/3$.

(5 marks)

- (d) Oil from an uncapped well in the ocean is radiating outward in the form of a circular film on the surface of the water. If the radius of the circle is increasing at the rate of 2 meter per minute, how fast is the area of the oil film growing when the radius is 100 meters?

(5 marks)

Q5 (a) Use *L'Hopital's* rule to find the limits below

(i) $\lim_{x \rightarrow 0} -\frac{2}{x} + \frac{2}{\ln(x+1)}$

(ii) $\lim_{x \rightarrow \infty} x^{1/\ln x^2}$

(10 marks)

(b) Given $y = \frac{x-1}{x^2+3}$

(i) Find the curvature K of the given curve at $x = 0$

(ii) Find the radius of the curvature ρ of the given at $x = -1$

(10 marks)

- END OF QUESTION -