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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2016/2017**

COURSE NAME : MATHEMATICS II
COURSE CODE : BBM 10403
PROGRAMME CODE : BBA/ BBB/ BBE/ BBF
EXAMINATION DATE : DECEMBER 2016/ JANUARY 2017
DURATION : 3 HOURS
INSTRUCTION : ANSWERS ALL QUESTIONS

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

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S1 (a) Given function, $f(x) = \begin{cases} -(x+4)^2, & x \leq -2 \\ |x+2|+1, & -2 < x \leq 1 \\ \sqrt{x-1}, & x > 1 \end{cases}$

(i) Sketch the graph of $f(x)$.

(6 marks)

(ii) Determine the domain and range of $f(x)$.

(2 marks)

(b) Based on the graph S1(a), find the limits of $f(x)$ at:

(i) $x = -2$

(ii) $x = 1$

(6 marks)

(c) Given $f(x) = x - 4$, $g(x) = x^2 - 2$ and $h(x) = \sqrt{x+1}$. Compute:

(i) $f \circ g$

(2 marks)

(ii) $f \circ g(3)$

(1 mark)

(iii) $f \circ g \circ h$

(3 marks)

S2 (a) Find the limits of the following functions:

(i) $\lim_{x \rightarrow 5} (2x^3 + 4x^2 - 3x + 1)$

(3 marks)

(ii) $\lim_{x \rightarrow 2} \frac{x^2 - 5x + 6}{2x^2 - 3x - 2}$

(4 marks)

(iii) $\lim_{x \rightarrow \infty} \frac{\sqrt{x^2 + 3}}{7x + 5}$

(4 marks)

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- (b) Determine the inverse function of $f(x) = \frac{2x-1}{x+2}$. (5 marks)

- (c) Given function, $f(x) = \begin{cases} -x, & x < 0 \\ x^2, & x > 0 \end{cases}$:
Sketch the graph of $f(x)$ and find the points of discontinuity. (4 marks)

- S3 (a) Find $\frac{dy}{dx}$ for:
i) $y = \frac{1}{x}$
ii) $y = (4x^2 + 2)(3x^3 - 1)$ (4 marks)

- (b) By using chain rule, compute $y = 10^{\sin^2(3x+5)}$. (6 marks)

- (c) If $3x^2 - xy + 3y = 7$, find $\frac{dy}{dx}$ by using implicit differentiation. (5 marks)

- (d) The radius, r of a spherical balloon at time, t seconds is given by $r = t^2 + t$. Express the volume of the balloon, $V \text{ cm}^3$ in terms of t and find the rate of change of the volume at $t=4$ seconds. Volume of the sphere is $V = \frac{4}{3}\pi r^3$. (5 marks)

- S4 (a) Find:
(i) $\int (\cos x + \sin x) dx$ (3 marks)

- (ii) $\int_1^4 (\sqrt{x} + \frac{1}{\sqrt{x}}) dx$ (3 marks)

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(b) By using substitution techniques, find;

(i) $\int \frac{2x+3}{x^2+3x+2} dx$

(ii) $\int \sin 15x dx$

(8 marks)

(c) Evaluate $\int \frac{x}{x+1} dx$ using partial fraction.

(6 marks)

S5 (a) Expand the following sequences:

(i) $\sum_{k=1}^4 2k^3 + 7k^2 + k$

(3 marks)

(ii) $\sum_{k=1}^5 5k^2$

(3 marks)

(b) The first term of a finite geometric series is 6 and the last term is 4374. The sum of all terms is 6558. Find the number of terms r .

(8 marks)

(c) A woman invests RM500 in a finance institution at the beginning of each year that pays 6% per annum compound interest. Calculate the amount of money she will have at the end of 10th year.

(6 marks)

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-END OF QUESTIONS-