UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020

COURSE NAME	:	ALGEBRA
COURSE CODE	:	BIC 10303
PROGRAMME CODE	:	BIS / BIP / BIW / BIM
EXAMINATION DATE	:	DECEMBER 2019 / JANUARY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

TERBUKA

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

SECTION A
State whether each of the following statement is TRUE or FALSE.

Q1 $(2 + \sqrt{5})$ is the conjugate of $(5 + \sqrt{2})$.

Q2 The equation $2x + 7 = 2(x + 5)$ has one solution.

Q3 If $10^y = x$ then $log\ x = y$.

Q4 $16x^5 + 3x^3 + 27x$ is a 3rd degree of polynomials which is known as cubic.

Q5 $4\sqrt{k} - 9$ is not a polynomial because $k^{\frac{1}{2}}$ exponent is not a natural number.

Q6 If a function and its inverse are functions, we say that it's "one-to-one".

Q7 Let the closed interval $[a, b]$ be the domain of function f. The domain of $f(x - 3)$ is given by the open interval (a, b).

Q8 Let A and B be $n \times n$ matrices. If A and B commute, then matrices A^2 and B must commute.

Q9 If A and B are symmetric $n \times n$ matrices, then the product AB is also symmetric.

Q10 If the system $Ax = b$ has a unique solution, then A must be a square matrix.

                    (10 marks)

         CONFIDENTIAL

SECTION B
Answer **ALL** questions.

Q11 (a) When $G(x) = 2x^2 + mx + n$ is divided by $x - 1$ and $x + 2$, it leaves remainders 5 and 26 respectively. Find the value of m and n.

(4 marks)

(b) Given that $x + 2$ is a factor of the polynomial for $P(x) = ax^3 + bx^2 - 3x - 2$ where a and b are constant.

(i) If $P(x)$ is divided by $x - 3$, the remainder is 70, find the values of a and b.

(4 marks)

(ii) Based on your answer in **Q11(b)(i)**, find the remainder when $P(x)$ is divided by $2x + 3$.

(4 marks)

(c) Divide $x^3 + 5$ by $x + 2$

(4 marks)

(d) Using proof by A, B and C, show that $\frac{4}{x-3} + \frac{1-4x}{x^2+2}$ is partial fractions of $\frac{13x+5}{x^3-3x^2+2x-6}$

(4 marks)

Q12 Given a function $f(x) = \sqrt{4 - 3x}$

(a) Show that f is a one-to-one function. Justify your answer.

(3 marks)

(b) Find the domain and range of f.

(3 marks)

(c) Determine the inverse function of f and state its domain and range.

(5 marks)

(d) Sketch the graph of f and f^{-1} on one diagram.

(4 marks)

TERBUKA

3

CONFIDENTIAL

Q13   If a rock falls from a height of 20 meters on earth, the height, H (in meters) after x seconds is approximately

$$H(x) = 20 - 4.9x^2$$

(a)   Determine the height of the rock when

   (i) $x = 1$ second

   (ii) $x = 1.1$ seconds

   (iii) $x = 1.2$ seconds

   (iv) $x = 1.3$ seconds

(8 marks)

(b)   Determine the fall time when the height is

   (i)   15 meters

   (ii)   10 meters

   (iii)   5 meters

(6 marks)

(c)   Based on your answers in **Q13(a)** and **Q13(b)**, sketch a graph of H in one diagram.

(3 marks)

(d)   Solve the following equations $(H \circ H)(x)$

(4 marks)

Q14   Given that matrix $A = \begin{pmatrix} 3 & 2x & x \\ 0 & x+1 & 6 \\ 0 & 0 & x \end{pmatrix}$ and $|A| = 60$

(a)   Find the values of x.

(3 marks)

(b)   Determine the cofactors and the adjoint matrix of A by using the positive value of x obtained in **Q14(a)**.

(4 marks)

(c)   Find the inverse matrix of A.   TERBUKA

(3 marks)

Q15 If matrix $A = \begin{pmatrix} 3 & -1 & 2 \\ -2 & 4 & 1 \\ 1 & -2 & -1 \end{pmatrix}$ and matrix $B = \begin{pmatrix} 2 & 5 & 9 \\ 1 & 5 & 7 \\ 0 & -5 & -10 \end{pmatrix}$,

(a) find the product AB.

(4 marks)

(b) find x, y and z if matrix $A \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 25 \\ -14 \\ 5 \end{pmatrix}$ by using the Cramer's Rule.

(7 marks)

Q16 Two companies A and B are awarding prize monies to their employees for leadership, innovation and punctuality. Company A decided to award a total prize monies of $RM8500$ for leadership, innovation and punctuality to four, five and two employees respectively. Company B decided to award a total prize monies of $RM4550$ for leadership, innovation and punctuality to three, two and one employees respectively. The total amount of prize monies awarded to each employee for leadership, innovation and punctuality is $RM2150$.

(a) If RMx, RMy and RMz represent the amount of prize monies awarded to an employee for leadership, innovation and punctuality respectively, write down a system of linear equations in x, y, z to represent the above information.

(3 marks)

(b) Find the values of x, y and z, by using the Gauss-Jordan elimination method.

(7 marks)

(c) With the same total amount of prize monies spent by companies A and B, determine whether it is possible for company A to award three employees for innovation instead of five employees. Justify your answer.

(3 marks)

-END OF QUESTIONS –

TERBUKA

CONFIDENTIAL