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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2013/2014

COURSE NAME	:	BASIC ALGEBRA (ALJABAR ASAS)
COURSE CODE	:	BBR 23703
PROGRAMME	:	3 BBR / 4 BBR
EXAMINATION DATE	:	JUNE 2014
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER FIVE (5) QUESTIONS FROM SIX (6) QUESTIONS

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

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Q1 (a) Find the sum of the following three polynomials

$$3y^{50} - 2y + y^{40} + 2y^{30} + 5,\ -y^{40} - 3y^{30} - 2 \text{ and } 2y^{50} + 3y^{30} + 9$$

(3 marks)

(b) Solve $x^2 - 3x + 2 = 0$ by

(i) completing the squares,

(5 marks)

(ii) quadratic formula.

(5 marks)

(b) Given that -1 is the root of $x^3 - 5x^2 - x + 5$. Hence, factorize completely the equation.

(7 marks)

Q2 Given the system of linear equation

$$3x - y + 2z = 4$$
$$-4x - 2y + 4z = -2$$
$$x + 2y + 3z = 6$$

(a) Write the system above into equation **AX** = **B**.

(2 marks)

(b) Find the determinant of matrix **A**.

(4 marks)

(c) Find the inverse of matrix **A**.

(12 marks)

(d) Use inversion to solve the system of linear equation.

(2 marks)

Q3 (a) Given that the fifth term of arithmetic sequence is 13 and its thirteenth term is -9.

(i) Find the value of first term, a and its common difference, d.

(4 marks)

(ii) Find the tenth term.

(2 marks)

(iii) Find the sum from first term until tenth term.

(2 marks)

(b) A geometric sequence is defined as $30, 20, \frac{40}{3}, \frac{80}{9}, \ldots$

(i) Find the value of common ratio, r.

(2 marks)

(ii) Calculate the tenth term, T_{10}.

(2 marks)

(iii) The sum for this sequence up to 10 terms, S_{10}.

(3 marks)

(iv) State whether this series converges or diverges. State your reason.

(2 marks)

(v) If it is converges, evaluate its summation, S_{∞}.

(3 marks)

Q4 (a) Expand the expression $\frac{1}{\sqrt{(1-2x)^3}}$ until the term of x^3 using Binomial series.

(5 marks)

(b) Expand the following expressions until the term of x^3 using Binomial series.

(i) $\frac{1}{(1+x)}$.

(5 marks)

(ii) $\frac{1}{(1+3x)}$.

(5 marks)

(c) From **Q4 (b)**, verify that $\frac{1}{(1+x)(1+3x)} = 1-4x+13x^2-40x^3 \ldots$.

(5 marks)

Q5 (a) The function f is given by $f(x) = -x^3 + 4$.

(i) Find the value of x such that $f(x) = 0$.

(2 marks)

(ii) Sketch the graph and determine the domain and range.

(4 marks)

(b) Given $f(x) = 2x - 7$, $h(x) = x^3 + 4$ and $g(x) = \dfrac{5}{x-1}$, calculate

(i) $f \circ g,\ f \circ g(2)$.

(3 marks)

(ii) $h \circ f,\ h \circ f(-5)$.

(3 marks)

(iii) the value of c if $h \circ f(c) = -5$.

(3 marks)

(c) Functions f and g are defined as $f(x) = e^{2x}$, $g(x) = x - 3$, $x \in \Re$. Sketch the graph of $f(x)$ and $g(x)$ and determine their domain and range.

(5 marks)

Q6 (a) For each equation, determine whether the conic section is circle, ellipse or parabola. State your reason.

(i) $x^2 + y^2 - 81 = 0$.

(4 marks)

(ii) $15x^2 - 15y^2 + 20x + 20y = 0$.

(3 marks)

(iii) $x^2 + 5x - 12y + 55 = 0$.

(3 marks)

(b) Write the equation for a circle with radius of $2\sqrt{3}$ and center at $(2, -2)$. Write the equation in the form of $ax^2 + bxy + cy^2 + dx + ey + f = 0$. Hence, sketch the circle.

(10 marks)

- END OF QUESTION -

FINAL EXAMINATION

SEMESTER / SESSION: SEM II 2013/2014 PROGRAMME : 3BBR / 4BBR
COURSE : BASIC ALGEBRA COURSE CODE : BBR23703

Polynomial

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$p(x) = (x-a)q(x) + r(x)$$

Matrices

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Cofactor, $C_{ij} = (-1)^{i+j} M_{ij}$ (M_{ij} is minor/determinant of the sub-matrix **A**)

Determinant of **A**, $|\mathbf{A}| = \sum_{i=1}^{k} \alpha_{ij} C_{ij}$

Inverse of **A**, $\mathbf{A} = \frac{1}{|\mathbf{A}|} Adj(\mathbf{A})$ where $Adj(\mathbf{A}) = C_{ij}^{T}$

For $\mathbf{AX} = \mathbf{B}$, $\mathbf{X} = \mathbf{A}^{-1}\mathbf{B}$

Arithmetic Series

(i) The nth term for arithmetic series, $T_n = a + (n-1)d$
where a is the first term and d is the common difference.

(ii) Common difference, $d = T_{n+1} - T_n$.

(iii) Sum for arithmetic series, $S_n = \frac{n}{2}\left[2a + (n-1)d\right]$ or $S_n = \frac{n}{2}\left[a + l\right]$.

Geometric Series

(i) The nth term for geometric series, $T_n = ar^{n-1}$
where a is the first term and r is the common ratio.

(ii) Common ratio, $r = \frac{T_{n+1}}{T_n}$.

(iii) Sum for geometric series, $S_n = \frac{a(r^n - 1)}{r - 1}$, $r > 1$ or $S_n = \frac{a(1 - r^n)}{1 - r}$, $r < 1$.

(iv) If $|r| < 1$, then the infinite geometric series converges with its summation, $S_\infty = \frac{a}{1-r}$.

(v) If $|r| > 1$, then the infinite geometric series diverges.

Binomial Series

$$(1+x)^r = 1 + rx + \frac{r(r-1)}{1(2)}x^2 + \frac{r(r-1)(r-2)}{1(2)(3)}x^3 + \ldots + \frac{r(r-1)(r-2)\ldots(r-n+1)}{n!}x^n$$