UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2014/2015

COURSE NAME	:	BASIC ALGEBRA
COURSE CODE	:	BBR 23703
PROGRAMME	:	BBR
EXAMINATION DATE	:	DECEMBER 2014/JANUARY2015
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)**QUESTIONS ONLY

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

Q1 (a) Expand the following expressions:

(i) $(x+3)(x+4)$

(ii) $(x^2+4)(x^2-4)$

(iii) $x^2(x^2+\frac{1}{x^2}+4)$

(iv) $(x^2+4)(x^2-4)$

(5 marks)

(b) Solve the equation $9x^2-6x=8$ by means of the following method:

(i) Factorization
(ii) Completing the square
(iii) Formula of quadratic equation

(15 marks)

Q2 (a) Find the sum of the following sequences:

(i) $\sum_{k=1}^{20} 5$

(ii) $\sum_{k=1}^{4} 3k$

(iii) $\sum_{k=1}^{5} (k^2-2k+15)$

(6 marks)

(b) The second and seventh term of arithmetic sequence are 75 and 55 respectively. Find
(i) The first term
(ii) The sum of the 31 terms

(8 marks)

(c) The first term of a geometric series 1. The sum of first and third term is 72. Find the possible values of the common ratio of the geometric series.

(6 marks)

Q3 (a) Solve the inequality $\frac{3x^2-10x-8}{x-3} \leq 0$. (14 marks)

(b) Sketch the graphs of the following functions on the same axis

$f(x)=2x^2$

$g(x)=2(x-2)^2$

$h(x)=2(x-2)^2-3$

(6 marks)

Q4 (a) Consider the following matrices:

$$A=\begin{pmatrix}2 & -1 & 1\\ 1 & 0 & 1\\ 3 & -1 & 4\end{pmatrix} \text{ and } B=\begin{pmatrix}1 & 3 & -1\\ -1 & 5 & -1\\ -1 & -1 & 4\end{pmatrix}$$

(i) Compute $|A|$ and B^{T}.

(ii) Compute AB. Hence deduce the inverse matrix A^{-1}.

(14 marks)

(b) Use the result obtained in (a), solve the following system of linear equations,

$$\begin{aligned}2x-y+z&=3\\ x+z&=1\\ 3x-y+4z&=0\end{aligned}$$

(6 marks)

Q5 (a) Determine the conic section for each of the following equations:

(i) $4x^2+9y^2=36$

(ii) $9x^2-16y^2+18x+32y-151=0$

(iii) $x^2+2x+12y+37=0$

(iv) $x^2+y^2=25$

(12 marks)

(b) Write the equation of a circle with radius $2\sqrt{2}$ and center $(0,3)$.

(4 marks)

(c) Consider the equation of a parabola $x^2=-16y$. Find the focus and the directrix of the parabola.

(4 marks)

Q6 (a) Determine the value of the following

$$\binom{6}{2},\ \binom{6}{4},\ \binom{n}{r},\ \binom{n}{n-r}$$

(10 marks)

(b) By using Binomial series expand $\dfrac{1}{(1+x)(1+x^2)}$ until the term x^3.

(10 marks)

- END OF QUESTION -

FINAL EXAMINATION

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Formulae

Factorization: $(x+a)(x+b)=x^2+(a+b)x+ab$

$(x-a)(x-b)=x^2-(a+b)x+ab$ and

$(x-a)(x+b)=x^2+(-a+b)x+ab$

Quadratic formula: $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$

Cofactor of a square matrix A: $C_{ij}=(-1)^{i+j}M_{ij}$

Determinant of a square matrix A: $|A|=\sum_{i=1}^{k}a_{ij}C_{ij}$

Inverse of a square matrix A: A^{-1}

Adjoint of a square matrix A: $\text{Adj(A)}=\left[C_{ij}\right]^T$

Sequence of numbers: $\sum_{k=1}^{n}k,\ \sum_{k=1}^{n}k^2,\ \sum_{k=1}^{n}ck$ and many others

Arithmetic series: $S_n=a+(a+d)+(a+2d)+(a+3d)+\cdots+[a+(n-1)]$

Sum of first *n* terms of arithmetic series: $S_n=\dfrac{n}{2}[2a+(n-1)d]$

General term of an arithmetic series: $T_n=a+(n-1)d$, n number of terms

Sum of first *n* terms of geometric series: $S_n=\dfrac{a(r^n-1)}{r-1}$, $r>1$

$S_n=\dfrac{a(1-r^n)}{1-r}$, $r<1$

General term of a geometric series: $T_n=ar^{n-1}$, n number of terms

Linear function: $y=mx+c$ where m is the gradient while c is theintercept on y *axis*

Quadratic function: $y=ax^2+bx+c$ where a,b,c are constans

Cubic function: $y=ax^3+bx^2+cx+d$ where a,b,c,d are constans

Logarithmic function: $y=\log_b x \quad b>0, b\neq 1$

Exponential function: $y=b^x \quad b>0, b\neq 1$

Rational function: $f(x)=\dfrac{p(x)}{q(x)}$ where $p(x)$ and $q(x)$ are polynomials

Composite function: $f\circ g,\ g\circ f$