MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

FIRST YEAR FIRST SEMESTER EXAMINATIONS FOR THE CERTIFICATE IN BRIDGING MATHEMATICS

CITY CAMPUS

SMA 001: ALGEBRA

Date: 21st November 2016 **Time:** 2.00 – 5.00 pm

INSTRUCTIONS:

- Answer question ONE and any other TWO questions.
- Marks will be awarded for clear and correct work and method shown.

QUESTION ONE. [COMPULSORY] [30 Marks]

(a) Express the following in their simplest form

(i) $\frac{(2x)^{\frac{n}{2}} \times (4xy)^{-\frac{n}{2}}}{(2xy)^{-\frac{n}{2}}}$

(ii) $\frac{x(x+1)(x-1)^2}{(x^2-1)^2}$

(iii) $\frac{4\log_4 5 - \log_2 5}{\log_{16} 125 - \log_{16} 5}$ **[9 Marks]**

(b) Solve the given equations giving the answers to 2 d . p . where this is relevant.

(i) $3^{x+2} = 27^{2x-1}$

(ii) $2^{2x} - 2^{x+1} - 3 = 0$ **[7 Marks]**

(c) (i) Expand $(1-2x)^{10}$ in the ascending powers of x up to the term containing x^3.

(ii) Us the above expansion to approximate $(0.998)^{10}$ to five decimal places. **[4 Marks]**

(d) (i) In how many ways can six different books be arranged on a shelf if the shelf can only accommodate four books at a time.

(ii) A mixed hockey team containing five men and six women is to be chosen from seven men and nine women. In how many ways can this be done ?

[5 Marks]

(e) (i) Find the number of terms in the series ;

$\frac{3}{4} + \frac{1}{2} + \frac{1}{3} + \cdots + \frac{32}{729}$.

(ii) Find the 14^{th} term in the series below;

-15 - 12 - 9 - … **[5 Marks]**

QUESTION TWO . **[20 Marks]**

(a) (i) Given that $n = log_7^{29}$, show that $\log_8 29 = n\log_8 7$.

(ii) Simplify $\left(log_3^{4^y}\right) \times \left(log_4^{3^x}\right)$. **[7 Marks]**

(b) (i) Solve for x if $log_2^x = log_4^{(4x+5)}$

(ii) Find log_3^5 correct to 3 decimal places **[11 Marks]**

(c) Solve for x in the equation; $8^{2x} + 8^x - 6 = 0$ correct to 2decimal places.

[2 Marks]

QUESTION THREE. **[20 Marks]**

(a) The sum of the first six terms of an A. P. is 48 and the seventh term is five times the first term.

(i) Find the first term and the common difference of the series.

(ii) Compute the sum of the first 10 terms of the A . P. **[8 Marks]**

(b) Consider the series $5 + 15 + 45 + 135 + \cdots$

(i) Determine the minimum number of terms of the series that gives a sum greater than 3×10^9

(ii) Find an expression for the sum of the first n terms of the series $2 + \frac{2}{3} + \frac{2}{9} + \frac{2}{27} + \cdots$ Hence calculate the sum to infinity of the series.

[12 Marks]

QUESTION FOUR. **[20 Marks]**

(a) (i) Expand $\left(1+\frac{x}{2}\right)^{20}$ in ascending powers of x up to the term having x^3.

(ii) Taking a suitable value of x, use the result of part (i) to approximate $(1.0005)^{20}$ to 7 d. p. **[5 Marks]**

(b) Considering the Binomial expansion of $\left(x^2-\frac{2}{x}\right)^9$. Find;

(i)the coefficient of the term in x^3.

(ii) the constant term. **[12 Marks]**

(c) Prove that $\binom{n}{r}=\binom{n}{n-r}$ where $\binom{n}{r}=\frac{n!}{(n-r)!\,r!}$ **[3 Marks]**

QUESTION FIVE. **[20 Marks]**

(a) Given the matrix $A=\begin{bmatrix}1 & 3 & 0\\ 2 & -2 & 1\\ -4 & 1 & -1\end{bmatrix}$; Find

(i) the adjoint of A

(ii) the determinant of A.

(iii) the inverse matrix of A **[16 Marks]**

(b) Use the result in part (a) to solve the following system of linear equations;

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

[4 Marks]