MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

FIRST YEAR FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE, BACHELOR OF EDUCATION AND BACHELOR OF ECONOMICS WITH INFORMATION TECHNOLOGY

MAIN CAMPUS

MMA 100: BASIC MATHEMATICS

Date: 10th December, 2016 Time: 8.30 - 11.30 am

INSTRUCTIONS:

- Answer question ONE and any other TWO questions.
- Observe further instructions on the answer booklet.

Question 1: Compulsory (30 marks)

a). With examples distinguish between sequence and series (4mks)

b). Solve for x if $\sqrt{(2x+1)} - \sqrt{x} = \sqrt{(x-3)}$ (2mks)

c). Given that the set $A = \{0, 1, 2\}$, the set $B = \{1, 2, 4\}$ and the universal set $U = \{0, 1, 2, 3, 4, 5, 6, 7\}$

a). Draw venn diagram for the information

b). List the members of the set

i). $\{x | x \in A \text{ or } x \in B\}$

ii). $\{x | x \in A \text{ and } x \in B\}$ (4mks)

d). Simplify the following

i). $\dfrac{x^{p+(\frac{1}{2})q} \times y^{2p-q}}{(xy^2)^p \times \sqrt{x^q}}$ (2mks)

ii). $\dfrac{(1+x)^{\frac{1}{3}} - \frac{1}{3}x(1+x)^{-\frac{2}{3}}}{(1+x)^{\frac{2}{3}}}$ (3mks)

e). Given $y = \log_a b$ show that $y = \dfrac{1}{\log_b a}$ hence, solve $\log_2 x + \log_x 2 = 2$ (6mks)

f). The sum of the second and the third terms of a G.P. is 9 and the seventh term is eight times the fourth. Find the first term, the common ratio and the fifth term of the G.P. (4mks)

g). Expand $(1+x)^{\frac{1}{2}}$ in ascending powers of x up to the term containing x^3. Hence evaluate $\sqrt{1.03}$ to 5 significant figures (5mks)

Question 2 (20mks)

a). i).Distinguish between permutations and combinations (4mks)

ii).How many different arrangements of the word PARRAMATTA are possible? (3mks)

iii). A committee of 5 people is to be chosen from a group of 6 men and 4 women. How many committees are possible if there are to be 3 men and 2 women? (3mks)

b). i). State the Binomial theorem (2mks)

ii).Expand $(3 + x)^{-2}$ in ascending powers of x as far as the term in x^3 and state the range of values for which the expansion is valid. (5mks)

iii).Find the constant term in the expansion of $(3x - \frac{1}{2x})^{14}$ (3mks)

Question 3 (20mks)

a). The general term of a series is given by $a_n = \frac{2^{n+1}}{3^n}$ show that the terms of the series form a Geometric Progression and find the sum of the first 9 terms (6mks)

b). A child lives 200 metres from school. He walks 60 metres in the first minute, and in each subsequent minute he walks 75% of the distance he walked in the previous minute. Show that he takes between 6 and 7 minutes to get to school (6mks)

c). The first, twelfth and last term of an arithmetic progression are $4, 31\frac{1}{2}$ and $372\frac{1}{2}$ respectively. Determine

a). the number of terms in the series

b). the sum of all the terms

(c) the 80th term. (8mks)

Question 4 (20mks)

a). i).Show that $\tan 3\theta = \dfrac{3\tan\theta - \tan^3\theta}{1 - 3\tan^2\theta}$ (5mks)

ii). Solve for θ in the interval $0° \leq \theta \leq 180°$ given $4\sin 2\theta + 5\cos 2\theta = 3$ (5mks)

b) .i). .What is a complex number? (2mks)

ii).Write the complex number $z = 1 + i$ in Euler form hence find $\ln z$ (5mks)

iii).State the de Moivres theorem (3mks)

Question 5 (20mks)

a). Define

i). Unit matrix

ii). Inverse of a matrix (2mks)

b). Given the matrix $A = \begin{pmatrix} 1 & 1 & 1 \\ 2 & -3 & 4 \\ 3 & -2 & -2 \end{pmatrix}$ Find

i). the adjoint of A (6mks)

ii). the determinant of A (4mks)

iii). the inverse of A (3mks)

c). Use the result in (b) to solve the system of linear equations

$$x + y + z = 4$$

$$2x - 3y + 4z = 33$$

$$3x - 2y - 2z = 2$$

(5mks)