KABARAK   **UNIVERSITY**

UNIVERSITY EXAMINATIONS
2009/2010 ACADEMIC YEAR
FOR THE DEGREE OF BACHELOR OF EDUCATION
SCIENCE

COURSE CODE: **MATH 100**

COURSE TITLE: **GENERAL MATHEMATICS**

STREAM: **SESSION I**

DAY: **WEDNESDAY**

TIME: **2.00 – 4.00 P.M.**

DATE: **07/04/2010**

INSTRUCTIONS:

1. Question ONE is compulsory.
2. **Attempt question ONE and any other TWO**

PLEASE TURN OVER

QUESTION ONE [30 MARKS]

a) Using examples, distinguish the following terms.
     I. Sequence and series
     II. Skewness and Kurtosis.

b) Simplify   i) $\left(\dfrac{6\sqrt{5}-4\sqrt{3}}{2\sqrt{5}-\sqrt{3}}\right)\left(\dfrac{5\sqrt{5}+3\sqrt{3}}{3\sqrt{5}-2\sqrt{3}}\right)$ [3 Marks]

        ii) $\log 15 + \log 25 + 4\log 3 + 3\log 2 - \log 243$ without using tables or a calculator.   [2 Marks]

c) Expand $(5 + x)^4$ and simplify your answer. Use your expansion to evaluate 5.02^4 correct to two decimal places.   [4 Marks]

d) Given the following matrices; $X = \begin{pmatrix} 5 & 3 \\ 8 & 2 \end{pmatrix}$ and $Y = \begin{pmatrix} 1 & 8 \\ 3 & 7 \end{pmatrix}$, evaluate XY [3 Marks]

e) For a given set of nine numbers $\sum(x-\bar{x})^2 = 60$ and $\sum x^2 = 285$. Find the mean and standard deviation.   [4 Marks]

f) Find dy/dx if $y = \dfrac{2x^2 - 3x}{5x+1}$ [3 Marks]

g) Find the value of the 12th term and the sum of the first 10 terms of the progression.
1, 3, 5, 7, ...   [3 marks]

h) Solve the following.
$$\dfrac{2y-3}{4} \geq \dfrac{6y+7}{3}$$ [3 marks]

QUESTION TWO [20 MARKS]

a) Determine the values of k for which the equation $4x^2 - 2kx + (2k-3) = 0$ has equal roots.

    [3 Marks]

b) Solve the equation $3^x.7^{2x+1} = 37$ correct to three significant figures.   [3Marks]

c) The longest movie ever made is a 1970 British film that runs for 48 hours. Assuming that the film speed is 24 frames per second, approximate the total number of frames in this film. Express your answer in scientific form.   [2 mark]

d) Archeologist can determine the height of a human without having a complete skeleton. If an archeologist finds only a humerus (the bone between the shoulder and the elbow) then the height of the individual can be determined by using a simple linear relationship. For a female, if x is the length of the humerus (in centimeters) then her height h (in centimeters) can be determined using the formula $h = 65 + 3.14x$ and for a male $h = 73.6 + 3.0x$ should be used.

   i) Find the height of a woman who has a 30 cm skeleton. [2 mark]

   ii) A person's height will typically decrease by 0.06centimetres each year after age of 30. Given that a man has a humerus of 34 centimeters and a height of 174 centimeters, determine his age. [3 Marks]

e) A furniture shop makes tables and chairs. The cost of making 8 tables and 5 chairs is Shs.14000. The cost of making 3 tables and 7 chairs is Shs.7300. The shop makes a profit of 30% and 40% on each table and chair respectively.

   i) Calculate the cost price of a table and a chair [5 Marks]

   ii) Calculate the selling price of a table and a chair [2 Marks]

QUESTION THREE [20 MARKS]

a) Use matrices to solve the following the system.
$$x - 2y + 4z = 15$$
$$3xy - z = -3$$
$$-x - 5y + 2z = 10$$
[10 Marks]

b) An employee who received fixed annual increments had a final salary of £ 9,000 p.a. after 10 years. If his total salary was £ 65,000 over the 10 years, what was his initial salary and monthly increments [4 Marks]

c) The fifth term of a G.P is 1/ and the seventh term is 1/32 find

   i) First term and the common difference. [3Marks]
   ii) Sum of the first twelve terms. [2 Marks]
   iii) The sum to infinity. [2 Marks]

QUESTION FOUR [20 MARKS]

a) The masses of 100 students were recorded in the table below:

Mass (Kg)	53 – 57	58 – 62	63 – 67	68 – 72	73 – 77	78 – 82	83 – 87	88 – 92
Frequency	2	12	12	25	27	10	9	3

Calculate:

   i)   The mean   [5 Marks]
   ii)   The standard deviation   [5 Marks]
   iii)   The median   [5 Marks]

b) Consider the percentage marks of two students who were each assessed on five tests.

Test	Student A	Student B
1	15	35
2	35	45
3	55	55
4	75	65
5	95	75

Determine the semi – interquartile range for the two students.   [5 Marks]

QUESTION FIVE [20 MARKS]

a) Find the derivative of the following

   i) $y = \dfrac{x^3 + 3x^2 + 2}{x}$ [4 Marks]

   ii) $y = \left(2x^3 + 4\right)\left(x^2 + 2x\right)$ [4 Marks]

b) A company has analyzed their operating conditions, prices and costs and has developed the following functions. Revenue £ (R) $= 800Q - 8Q^2$ and Cost £ (C) $= 2Q^2 + 20Q + 60$ where Q is the number of units sold. The company wishes to maximize profits and wishes to know. What quantity should be sold and what price   [7 marks]

c) If $dy/dx = 20x^3 - 12x^2 + 5$ for a particular curve, and it is known that $y = 40$ when $x = 2$. Determine y in terms of x.   [3 marks]

d) Evaluate $\int_0^1 (x - 5)^5 \, dx$ [4 marks]