Machakos University College

(A Constituent College of Kenyatta University)

University Examinations 2014/2015

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

First Year First Semester Examination for Diploma in Information and Communication Technology

DIT 103: MATHEMATICS FOR COMPUTING

Date: 10/12/2014 Time: 8:30 - 11:00 am

Instructions to the Candidate:+

1. *Answer **Question one** and any other **two** questions.*
2. *You must have a Scientific Calculator.*

1. (a) Differentiate between the following types of data as used in statistics:

   (i) Primary data and secondary data;

   (ii) Quantitative data and qualitative data. (4 *marks*)

   (b) The data given below represents the relative frequency distribution of the weights of patients who attended Masaku General Hospital in a given week.

Weight in kg	40 - 45	45 - 50	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80	80 - 85	85 - 90
No. of Patients	0.012	0.032	0.064	0.128	0.160	0.208	0.176	0.136	0.060	0.024

   Determine the following measures about the weights of the patients:

   (i) Median.

   (ii) Mean. (6 *marks*)

   (c) The motor vehicle registration system in Kenya uses a combination of letters and digits to register vehicles. The format used is *"Kll dddl"* where:

   - the 1 st character must be letter K;
   - the 2 rd and 3 th characters must be any letters of the alphabet;
   - the 4 th, 5 th and 6 th characters must be any numeric digits;
   - the 7 th character must be any letter of the alphabet;

   Determine the maximum number of motor vehicles which can be registered using this system if the letters 'I' and 'O' must not be used because they can be confused with digits. (6 *marks*)

   (d) Expand the binomial expression $(3x + 2y)^4$ in descending powers of x. (6 *marks*)

(e) Solve the following quadratic equations:

(i) $\frac{3}{x} + \frac{4}{x+1} = 2$ (2 *marks*)

(ii) A rectangular plot of land has a perimeter of 60 metres and covers an area of 216 square metres. Determine the lengths of its two sides. (4 *marks*)

(f) Explain the term *derivative* of a function as used in Mathematics. (2 *marks*)

2. (a) Differentiate between the *positional value* and the *absolute value* of a digit in a number illustrating using an example of a number. (5 *marks*)

(b) With the aid of mathematical notations, highlight any **two** properties of the mean as a statistical measure of central tendency. (4 *marks*)

(c) An educational survey conducted by the Ministry of Education among a random sample of 500 candidates in exam performance in science subjects in KCSE found out the following information about the candidates:

- 200 passed in Chemistry
- 244 passed in Biology
- 172 passed in Physics
- 92 passed in Chemistry and Biology
- 80 passed in Chemistry and Physics
- 84 passed in Biology and Physics
- 44 passed in Chemistry, Biology and Physics

(i) Present this information in a Venn diagram. (8 *marks*)

(ii) Determine the number of candidates who passed in:

- exactly one science subject.
- exactly two science subjects.
- at least two science subjects. (3 *marks*)

3. (a) Define the term *logic gate* as used in digital electronic systems. (2 *marks*)

(b) Explain each of the following logic gates using circuit diagrams and truth tables:

(i) OR gate;

(ii) AND gate;

(iii) NOT gate

(iv) Exclusive OR gate. (8 *marks*)

(c) Convert each of the following number systems to their respective equivalents:

(i) 43726_8 to hexadecimal;

(ii) $8D5E_{16}$ to octal. (4 *marks*)

(d) Explain each of the following character coding systems as used in computer data representation:

(i) Extended BCD;

(ii) ASCII;

(iii) EBCDIC. (6 *marks*)

4. (a) Explain briefly the following measurement scales, illustrating with suitable examples:

(i) Nominal scale;

(ii) Ordinal scale;

(iii) Interval scale;

(iv) Ratio scale. (10 *marks*)

(b) A committee of 6 members is to be formed from a group of 8 men and their wives. Determine the number of ways in which the committee can be constituted if:

(i) A man and his wife must not both serve in the same committee;

(ii) A man and his wife must not both serve in the same committee, and each sex must be at least one third in the committee to ensure gender representation. (8 *marks*)

(c) Perform the following binary arithmetic operation:

$110111_2 + 101011_2$; (2 *marks*)

5. (a) State the condition(s) which must be satisfied for multiplication operation to be performed on two matrices. (2 *marks*)

(b) Given the following matrices

$$A = \begin{bmatrix} 4 & 7 \\ 3 & 6 \end{bmatrix}, \qquad B = \begin{bmatrix} 4 & 6 & 2 \\ 2 & 3 & 5 \\ 5 & 0 & 1 \end{bmatrix}, \qquad C = \begin{bmatrix} 5 & 3 \\ 2 & 6 \\ 3 & 1 \end{bmatrix}$$

Determine the following:

(i) A^{-1}

(ii) B^T

(iii) C X A (6 *marks*)

(c) Differentiate the following polynomial functions with respect to x:

(i) $y = 3x^2 - 12x - 7;$

(ii) $y = 3x^3 - 4x^2 + 2x - 9.$ (4 *marks*)

(d) A poultry farm analysed its past financial data and derived its revenue function as given by the equation $R(x) = 11x - x^2 - 8$, and the cost function as $C(x) = 12 - x$, where x represents the number of chicken in hundreds while the revenue and cost are in ten thousands Kenya shillings. Determine the following about the farm:

(i) The profit function;

(ii) The break-even point(s);

(iii) The number of chicken that maximises profit and the corresponding profit. (8 *marks*)