KABARAK   UNIVERSITY

EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER SCIENCE

COURSE CODE: MATH 110

COURSE TITLE: BASIC MATHEMATICS

STREAM: Y1S1

DAY: WEDNESDAY

TIME: 9.00 – 11.00 A.M.

DATE: 12/08/2009

INSTRUCTIONS:

Answer Question **ONE** and any other **TWO** Questions.

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

(a) Consider the following logical equivalence summarized below and draw the truth table to extract to the logical conclusion.

$$(p \to q) \wedge (q \to p) = p \iff q$$ **(4 marks)**

(b) Write the general term(s) of the following sequences

   (i) $\left\{ \frac{1}{2}, \ 2, \ \frac{1}{3}, \ 2, \ \frac{1}{2}, \ 2 - - - \right\}$

   (ii) $\left\{ 1, 2, \ \frac{1}{3}, \ 4, \ \frac{1}{5} - - - \right\}$

   (iii) $\left\{ 1, \ \frac{1}{3}, \ \frac{1}{5}, \ \frac{1}{7} - - - \right\}$ **(6 marks)**

(c) Prove by mathematical induction that $1^2 + 2^2 + 3^2 + ---- + n^2 = \frac{1}{6}\{n \ (n+1)(2n+1)\}$

                                                                     (4 marks)

(d) Use the Venn's diagrams to illustrate.

        (i) $(A \cap B)^1$ **(3 marks)**

        (ii) $(A \cup B)^1$ **(3 marks)**

(e) Prove that $\frac{m}{n} + \sqrt{2}\frac{p}{q}$ is irrational.   **(5 marks)**

(f) What is the smallest number of terms of the geometrical progression $8 + 24 + 72 + ---$, that will give a total greater than 6,000,000?   **(5 marks)**

QUESTION TWO (20 MARKS)

(a) The general geometrical progression is given by a, ar, ar^2, ------, ar^{n-1}

    (i)   Derive the equation of getting the sum of G.P's.   **(7 marks)**

    (ii)   In a geometrical progression the sum of the second and third terms is 6 and the of third and fourth terms is -12. Find the first term and common ratio.

                                                              (7 marks)

    (iii)   Using the concept of infinite progressions express $0 \cdot \dot{7}$ as a fraction in the lowest form.   **(4 marks)**

(b) Evaluate $\dfrac{(n+5)!}{(n+2)!}$ **(2 marks)**

QUESTION THREE (20 MARKS)

(a) Using the truth tables prove;

     (i) $(A \cup B)^1 = A^1 \cap B^1$ **(5 marks)**

     (ii) $(A \cap B)^1 = A^1 \cup B^1$ **(5 marks)**

(b) A ball is dropped from a certain height first bounce takes $^2/_3$ of the time of the previous bounce.

Find;

     (i) Total time for the first 4 bounces   **(3 marks)**

     (ii) Total time until bouncing stops   **(2 marks)**

(c) Show that between two rational numbers there is an irrational number.   **(5 marks)**

QUESTION FOUR (20 MARKS)

(a) Prove the identify $\sin 3A = 3\sin A - 4\sin^3 A$ **(7 marks)**

(b) In how many ways can a team of 5 pupils be formed so as to include at least one boy from a population of 3 boys and 4 girls?   **(3 marks)**

(c) Use binomial theorem to find the coefficient of X^6 in the expansion $(3x - 2)^{15}$

                                                           (2 marks)

(d) How many even numbers greater than 50,000 be formed with the digits 3, 4, 5, 6, 7, 0 without repetition.   **(8 marks)**

QUESTION FIVE (20 MARKS)

(a) Prove that $n_{C_r} = \dfrac{n!}{(n-r)!\,r!}$ **(8 marks)**

(b) Solve the equation $1 + \cos\theta = 2\sin^2\theta$ for values of θ between 0° and 360°. **(6 marks)**

(c) Find $f^{-1}(x)$, Given $f(x) = 2x^2 + 4x + 2$ **(4 marks)**

(d) In how many ways can the letters of the word BESIEGE be arranged?   **(2 marks)**