CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DIPLOMA IN COMPUTER SCIENCE

COSC 0170: MATHEMATICS FOR COMPUTING 1

STREAMS: DIP. COMPUTER SCIENCE   **TIME: 2 HOURS**

DAY/DATE: TUESDAY 04/12/2018   **8.30 A.M. – 10.30 A.M.**

INSTRUCTIONS:
- **Answer question ONE and any other TWO.**

QUESTION ONE

(a) Define the following terms as used in elementary logic

     (i)   Simple statement
     (ii)   Compound statement
     (iii)   Tautology
     (iv)   Fallacy   (4 marks)

(b) Simply $\dfrac{7i-2}{i}$ (3 marks)

(c) Solve the quadratic equation $2x^2-5x-3=0$ by the factorization method. (4 marks)

(d) Find the equation of a line whose gradient is $\dfrac{1}{2}$ and passing through the point (0, 1).

                                                        (3 marks)

(e) Find the equation of a circle centred $-(4,3)$ and has radius 7 units. (4 marks)

(f) Solve the inequality $3<\dfrac{6-3x}{2}<6$ and hence plot the solution on a number line.

                                                        (5 marks)

(g)   Given $f(x)=4x^2+5x-3$
           $g(x)=-7x+x^2$
           $h(x)=3x^3-6x^2+7$

       find   (i) $f(x)+g(x)$
               (ii) $h(x)+g(x)-f(x)$
               (iii) $f(x)-h(x)$ (4 marks)

(h)   Differentiate the function $f(x)=\dfrac{x}{1+x^2}$ (3 marks)

QUESTION TWO

(a)   In how many ways can the letters of the word MISSISSIPPI be arranged so that the
       vowels come together?   (4 marks)

(b)   Consider the sets

       B = (1, 2, 3, 4, 5)
       C = (2, 4)
       D = (1, 2, 3)

       Find   (i)   (B ∪ C) ∩ D
               (ii)   B ∪ (C ∩ D)   (4
marks)

(c)   State the properties of real numbers in the equations below.

       (i)   If 5(10) = 5(4+6) and 5(4+6) = 20 +30 then 5(10) = 20+30

       (ii)   5 (3 + 2) = 5(3+2)

       (iii)   24(2) = 2(24)

       (iv)   5 × 1 = 5   (4 marks)

(d)   Find the quotient and the remainder when $2x^3+x^2-13x+6$ is divided by $x-2$
                                                                    (4 marks)

(e)   Solve the equation $3x^2+2x+1=0$ using the quadratic formula.   (4 marks)

QUESTION THREE

(a)   Find the expansion of $(a-2b)^{-5}$ using the coefficient from the Pascal's triangle.

(5 marks)

(b)   Define a function $f(t)$ by

$$f(t)=\begin{cases} 3t^2+4 & if\ t\leq-4 \\ 5 & if-4<t\leq5 \\ 1-6t & if\ t>6 \end{cases}$$

Find   (i) $f(-6)$

      (ii) $f(1)$

      (iii) $f(5)$

      (iv) $f(10)$ (5 marks)

(c)   The length of a rectangle is one meter greater than the width. If the area of the rectangle is $72\,m^2$, find the length and the width.   (5 marks)

(d)   Plot the graph of the quadratic equation $y=x^2$,   hence approximate the solutions to the equation from the graph.   (5 marks)

QUESTION FOUR

(a)   Find the radius and centre of the circle that passes through the points (7, 1), (0, 0), (-1, 7)

(10 marks)

(b)   Find the derivatives of the following functions using the rule indicated

      (i) x^3-x^2+x-1 (2 marks)

      (ii) $(x^2-2)(x+1)$ (2 marks)

      (iii) $\dfrac{x}{x^2-x+1}$ (3 marks)

      (iv) $\dfrac{x^4-3x^2+4¿^4}{¿}$ (3 marks)

QUESTION FIVE

(a) Peter has five friends. In how many ways can he invite at least 3 of his friends to his birthday party? (4 marks)

(b) Prove analytically that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ (5 marks)

(c) By the help of a truth table, show that
$$(pvq) = p \wedge q$$ (5 marks)

(d) From a group of 7 men and 6 women, 4 men and 3 women are to be selected to form a committee. In now many ways can this be done? (3 marks)

(e) Given $\partial = 4 - 6i, find |\partial|$ (3 marks)