CHUKA UNIVERSITY

DIPLOMA IN COMPUTER SCIENCE

COSC 0170: MATHEMATICS FOR COMPUTING 1

DEC-MARCH 2021 EXAM

INSTRUCTIONS:

- Answer question **ONE** and **TWO** other questions
- Sketch maps and diagrams may be used whenever they help to illustrate your answer
- Do not write anything on the question paper
- This is a **closed book exam**, No reference materials are allowed in the examination room
- There will be **No** use of mobile phones or any other unauthorized materials
- Write your answers legibly and use your time wisely

QUESTION ONE: (30 MARKS)

(a) Identify the property of real numbers being applied in each of the following
   (i)   *5(2x + 7) = 10x + 35*
   (ii)   *24(2) = 2(24)*

   (iii)   *(7 + 8) + 2 = 7 + (8 + 2)*

   (iv)   *If 5+4=9 and 9= y, then 5+4=y*   (4 marks)

(b) Define the following types of number system; give an example in each case.

   i.   Rational numbers

   ii.   Irrational numbers

   iii.   Complex numbers   (3 marks)

(c) Using an illustration, define the following terms as used in Set theory

   i.   Union of sets
   ii.   Intersection of sets
   iii.   Complement of a set
   iv.   Universal set   (4 marks)

(d) Find $\dfrac{dy}{dx}$ of $(2x^3-x^2+2)^5(x-2)$ (4 marks)

(e) Show that $P \Leftrightarrow Q = (P \rightarrow Q) \wedge (Q \rightarrow P)$ (4marks)

(f) Given $f(x)=4x^2+1$

        $g(x)=3x-7$,

    Find,

      i) $fog(0)$ (2 marks)

      ii) $gof(-2)$ (2 marks)

(g) Find the quotient and the remainder when the polynomial $p(x) = x^4 + 2x^3 - x - 2$ is divided by $(x - 1)$ (4 marks)

(h) A committee of 2 men and 4 women is to be formed from 6 men and 10 women. How many ways can this be done?   (3 marks)

QUESTION TWO: (20 MARKS)

(a) Find $\dfrac{dy}{dx}$ using method of choice or the indicated technique in the bracket

(i) $y=\dfrac{1}{x^2}+\sqrt[3]{x}$ (3 marks)

(ii) $y=(3x^2+2)(x^3-1)$ (Product rule)   (3 marks)

(iii) $y=\dfrac{x^2-5x}{2x+1}$ (Quotient rule)   (3 marks)

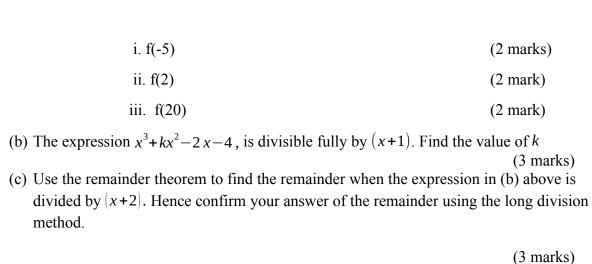(iv) $y=(7x^4-2)^{-2}$ (Chain rule)   (3 marks)

(b) Find the gradient of the curve $y=x^3-2x^2+1$ at $x=2$ (3 marks)

QUESTION THREE: (20 MARKS)

(a) Given the function whose equation below

$$f(x) = \begin{cases} 3x^2 + 4, & if \ x \leq 4 \\ 10, & if \ -4 \leq x \leq 15 \\ 1 - x & if \ x > 15 \end{cases}$$

       Calculate

i. f(-5) (2 marks)

ii. f(2) (2 mark)

iii. f(20) (2 mark)

(b) The expression $x^3 + kx^2 - 2x - 4$, is divisible fully by $(x+1)$. Find the value of k

(3 marks)

(c) Use the remainder theorem to find the remainder when the expression in (b) above is divided by $(x+2)$. Hence confirm your answer of the remainder using the long division method.

(3 marks)

(d) Solve the equations below using the factor method, completing square method and the formulae method and compare your answers. (8 marks)
   i. $x^2 + 3x + 2 = 0$
   ii. $7x^2 + 9x + 2 = 0$

QUESTION FOUR: (20 MARKS)

a) Differentiate between a whole number and an integer giving relevant examples

(4 marks)

b) Find the radius and the centre of a circle that passes through points P(2,1),Q(0,5) and R(-1,2) (10 marks)

c) Expand the following functions using appropriate method

   i. $(x+2y)^4$ (3 marks)

   ii. $(x-1/x)^6$ (3 marks)

QUESTION FIVE: (20 MARKS)

(a) Define the term Void sets as used in Set Theorem giving two examples (3 marks)

(b) Proof the following laws as applied in Set Theorem (13 marks)

   i) $A \cup (B \cup C) = (A \cup B) \cup C$

   ii) $A \cap (B \cap C) = (A \cap B) \cap C$

   iii) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

(c) How many arrangements are there in the letters of the given word (4 marks)

   COMMITMENT