

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DIPLOMA IN COMPUTER SCIENCE

COSC 0170: MATHEMATICS FOR COMPUTING I

STREAMS: DIP (COMP SCI) YISI

TIME: 2 HOURS

DAY/DATE: THURSDAY 04/12/2020

11.30 AM – 1.30 PM

INSTRUCTIONS:

- Answer all questions in Section I and any other two in Section
- Do not write anything on the question paper
- Non-programmable electronic calculators may be used
- Write your answers legibly and use your time wisely

SECTION I

QUESTION ONE (30 MARKS)

- a) Define the following types of number systems; give an example in each case. (3marks)
- i. Integers
 - ii. Rational numbers
 - iii. Complex numbers

- a) Use the following piecewise function to evaluate for the given values of x.

$$f(x) = \begin{cases} -x^2 + 2 & x < -2 \\ 2x + 1 & \text{for } -2 \leq x < 0 \\ x^2 + 2 & x \geq 0 \end{cases}$$

- i) $f(5)$ (2 marks)
- ii) $f(-4)$ (2 marks)
- iii) $f(-2)$ (2 marks)

- b) Identify the property of real numbers being applied in each of the following (3 marks)

- i) $5(2x + 7) = 10x + 35$
 ii) $24(3) = 3(24)$
 iii) $(7 + 8) + 2 = 7 + (8 + 2)$
- c) Given the function $f(x) = x^2 - x - 2$,
 find $f(x+k)$, given $k=4$ (4 marks)
- d) In how many ways can the letters of the word COMMITTEE be arranged in order for the vowels to come together? (4 marks)
- e) Obtain the remainder and the Quotient when $2x^3 + x^2 - 6x + 9$ is divided by $x - 2$ (5 marks)
- f) Write down the series $\sum_{i=-2}^5 2^{i+1}$ in full and evaluate it (5 marks)

SECTION II

QUESTION TWO (20 MARKS)

- a) Given that $f(x) = x - 2$ and $g(x) = 3x^2 + 1$, evaluate
 i. $f \circ g(2)$
 ii. $g \circ f(3)$
 iii. $f \circ f(x)$ (6 marks)
- b) Use Pascal's triangle to write out the expansion of $(3x - 4y)^5$ (5 marks)
- c) Solve for n in $nC_2 = 28$ (5 marks)
- d) Find the sum of the positive integers from 1 to 120 inclusive. (4 marks)

QUESTION THREE (20 MARKS)

- a) Define the following terms as used in elementary mathematical logic
 i) Logical statement (2 marks)
 ii) Truth table (2 marks)
 iii) A simple statement (2 marks)
 iv) A compound statement (2 marks)
- b) Show that $P \Leftrightarrow Q = (P \rightarrow Q) \wedge (Q \rightarrow P)$ (6 marks)
- c) Proof by commutative law that $A \cap B = B \cap A$ (6 marks)

QUESTION FOUR (20 MARKS)

- a) Find $\frac{dy}{dx}$ of $(2x^3-x^2+2)^5(x-2)^3$ (5 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) Given $A=\{5,5,8,15\}$
 $B=\{5,5,10,12\}$
 $C=\{5,8,10,20\}$

Find $B \cap C$, $(A \cup C) \cap B$, $(A \cup B \cup C)^c$ and $A^c \cap B^c$ with the help of a Venn diagram (5 marks)

QUESTION FIVE (20 MARKS)

- a) From a group of 7 men and 6 women, 5 persons are to be selected to form a committee so that at least 3 men are there in the committee. In how many ways can this be done (5 marks)
- a) Simplify $\frac{\cos^2 \theta}{1 + \sin \theta} + \frac{\cos^2 \theta}{1 - \sin \theta}$ (5 marks)
- b) Find the quotient and the remainder when $x^5 + 1$ is divided by $x - 1$ (5 marks)
- a) From a bag containing 5 white balls, 2 blue balls and 9 red balls. One ball is drawn at random. What is the probability that either blue or red ball is drawn. (5 marks)