TECHNICAL UNIVERSITY OF MOMBASA

INSTITUTE OF COMPUTING AND INFORMATICS

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

UNIVERSITY EXAMINATION FOR:

BACHELOR OF BUSINESS & INFORMATION TECHNOLOGY/ BACHELOR OF TECHNOLOGY IN INFORMATION TECHNOLOGY

EIT 4110: DISCRETE STRUCTURES

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2HOURS

DATE: Pick DateSelect MonthPick Year

Instructions to Candidates
You should have the following for this examination
-Answer Booklet, examination pass and student ID
This paper consists of **FIVE** questions. Attemptquestion ONE (Compulsory) and any other TWO questions.
Do not write on the question paper.

Question ONE

a) Differentiate between the following terms   (16 marks)

   i) Random experiment and events

   ii) Elementary events and compound events

   iii) Mutually exclusive events and complementary events

   iv) Open sentence and logical reasoning

b) Construct the truth table for the following compound proposition $(p \lor q) \to \neg(p \lor r)$.   (8 marks)

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

Question TWO

a) Explain the meaning of the following terms   (8 marks)

   i) A proposition

   ii) A predicate

   iii) Tautology

   iv) Contradiction

b) State and explain the Pigeonhole principle.   (4 marks)

c) Prove that the statement $(p \rightarrow q) \vee (q \rightarrow p)$ is a tautology. (8 marks)

Question THREE

a) Twenty – four dogs are in kennel. Twelve of the dogs are black, six of the dogs have short tails and fifteen of the dogs have long hair. There is only one dog that is black with a short tail and long hair. Two of the dogs are black with short tails and do not have long hair. Two of the dogs have short tails and long hair but are not black. All of the dogs in the kernel have at least one of the mentioned characteristics. Draw a Venn diagram and show many dogs are black with long hair but do not have short tails. (8 marks)

b) A science debating team consists of 4 speakers

i) In how many ways can all 4 speakers be arranged in a row for a photo? (3 marks)

ii) How many ways can the captain and vice – captain be chosen? (3 marks)

b) The table below specifies a Boolean function $f : S \times S \times S \longrightarrow S.$

x	y	z	f(x, y, z)
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	0

Give a Boolean expression corresponding to this function. (6 marks)

Question FOUR

a) City residents were surveyed recently to determine readership of newspapers available. 50% of the residents read the morning paper, 60% read the evening paper, and 20% read both newspapers. Find the probability that a resident selected reads either the morning or evening paper or both the papers. (5 marks)

b) Represent mathematically the following statement (3 marks)

A natural number, if divided by a natural number, may not remain a natural number

c) A survey of 126 Kenyan students found that:

92 students are taking at least an English class
90 students are taking at least a Math class
68 students are taking at least a Science class
36 students are taking English, Math, and Science classes
68 students are taking at least English and Math classes
47 students are taking at least Math and Science classes
51 students are taking at least English and Science classes

i) Draw a Venn diagram to represent the above information. (4 marks)

ii) How many students are only taking an English class? (4 marks)

iii) How many students are not taking English, Math, or Science classes? (4 marks)

Question FIVE

a) Differentiate between the following terms   (16 marks)

   i) Permutation and combination

  ii) Random experiment and events

 iii) Elementary events and compound events

 iv) Mutually exclusive events and complementary events

b) For the following statement, find its negation and simply your answer. Is this negated statement true? Explain your answer.   (4 marks)

$$\forall x \in \mathbb{R}, \quad (x > 2) \longrightarrow (x^2 > 3)$$