



# 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: 2 HOURS**

**DATE:** Pick Date Select Month Pick 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. Attempt question ONE (Compulsory) and any other TWO questions.

**Do not write on the question paper.**

#### **Question ONE**

- a) Define the following terms (8 marks)
- i) A proposition
  - ii) A predicate
  - iii) Tautology
  - iv) Contradiction
- b) Compute the truth table for the statement  $[(p \wedge q) \vee r] \Rightarrow (\sim q)$ . (8 marks)
- c) State and explain the Pigeonhole principle. (4 marks)
- d) How many ways can a committee of three faculty members and two students be selected from seven faculty members and 8 students. Show your work. (6 marks)
- e) Translate the following proposition into a sentence in English (4 marks)

#### **Question TWO**

Differentiate between the following terms (20 marks)

- a) Permutation and combination
- b) Random experiment and events
- c) Elementary events and compound events

- d) Mutually exclusive events and complementary events
- e) Open sentence and logical reasoning

**Question THREE**

- a) Prove that the statement  $(p \rightarrow q) \vee (q \rightarrow p)$  is a tautology. (6 marks)
- b) Prove by mathematical induction that  $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$  (6 marks)
- c) Given that  $A = \{1,3,5,7,9, 11,13,17\}$ ,  $B = \{5,9,13,17\}$ 
  - i) Find  $A - B$  (3 marks)
  - ii) Using Venn diagram to represent (i) above (3 marks)
  - iii) Show using a diagram that set B is a proper subset of set A. (2 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) There are three factories J, K, L supplying goods to warehouses A, B, C and D, the amount of supplies from the factories to warehouses are shown below.

Warehouses Factory	A	B	C	D	Total
J	72	16	15	50	153
K	38	18	13	22	91
L	50	32	22	43	147
Total	160	66	50	115	391

Find the following

(9 marks)

- i)  $J \cup A$
- ii)  $C \cup L$
- iii)  $K \cup D$

- c) Write down a truth table to show that  $\sim (p \vee q)$  is equivalent to  $(\sim p) \wedge (\sim q)$ . (6 marks)

**Question FIVE**

- a) 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 are taking only Math and Science classes? (4 marks)
  - iv) How many students are not taking English, Math, or Science classes? (4 marks)

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

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.

(4 marks)