TECHNICAL UNIVERISTY OF MOMBASA

Faculty of Engineering & Technology

UNIVERSITY EXAMINATION FOR:
BACHELOR OFTECHNOLOGY IN INFORMATION TECHNOLOGY
(BTIT 13S – Y3 S1)

EIT 4110: DISCRETE STRUCTURES

END OF SEMESTER EXAMINATION
SERIES: APRIL 2014
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*

This paper consists of **FIVE** questions.
Attempt question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (Compulsory)

a) Distinguish between "Logic" and "Propositional Logic" **(4 marks)**

b) Use a directed graph to represent the relationship R = {(1, 1), (1, 3), (2, 1), (2, 3), (2, 4), (3, 1), (3, 2), (4, 1)} **(4 marks)**

c) Find the Cartesian product A x B given A = {1, 2, 3, 4} and B = (x, y, z). Hence show that product B x A is not same as B x A. **(6 marks)**

d) Define the following terms:
- **(i)** Tautology
- **(ii)** Contradiction
- **(iii)** Power set
- **(iv)** Multigraph
- **(v)** Logical equivalence **(10 marks)**

e) Find the negation of the statement "I will have an exam today" **(2 marks)**

f) Define the term "Bit String". Hence find the bitwise OR of 11110000 and 10101010. **(4 marks)**

Question Two

a) Show that $\neg(p\,q) \Longleftrightarrow \neg p \neg q$ **(4 marks)**

b) Define the following terms:

(i) Cardinality

(ii) Proposition function **(4 marks)**

c) Find the power set of the set {1, 2, 3} **(4 marks)**

d) Edward the IT manager ABC Company Ltd stays at a hostel for three days. His menu for breakfast each day is a choice one of 3 types of egg dish, or one of 2 types of meat or one type of fish. In how many ways can he arrange his breakfast if he does not have any egg two days running nor repeat any dish? **(8 marks)**

Question Three

a) Define the following terms: **(4 marks)**

(i) Binary relation

(ii) Symmetric relation **(4 marks)**

b) Find the adjacency matrix for the graph below. **(6 marks)**

c) Draw a graph with the adjacency matrix below: **(5 marks)**

$$\begin{pmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{pmatrix}$$

d) Use an incidence matrix to represent the following graph:

Question Four

$\varepsilon = \{1,2,3...,20\}, A = \{5,10,15,20\},\ B = \{2,4,6,8,10,12,14,16,18,20\}$ *and* $C = \{3,6,9,12,15,18\}$

a) Let draw a Venn diagram and find:

(i) $(A \cap B) \cap C$

(ii) $(A \cup B \cup C)'$ **(14 marks)**

b) Explain the following terms:

(i) Theorem

(ii) Lemma

(iii) Corollary **(6 marks)**

Question Five

a) Prove that if "3n + 2 is odd, then n is odd" **(8 marks)**

b) Prove by contradiction that "$\sqrt{2}$ is irrational" **(6 marks)**

c) Prove that if "n is odd, n^2 is odd" **(6 marks)**