FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

SCHOOL OF INFORMATION AND COMMUNICATION TECHNOLOGY

DEPARTMENT OF INFORMATION AND MEDIA TECHNOLOGY

SECOND SEMESTER 2014/2015 EXAMINATION

COURSE CODE:	CIT 224
COURSE TITLE:	DISCRETE MATHEMATICS
CREDIT UNITS:	3
TIME ALLOWED:	2HRS 45MIN
COURSE LECTURER(S):	Mrs Stella O. Etuk
NUMBER OF QUESTIONS:	4
NUMBER OF PAGES:	2 (INCLUDING THIS PAGE)

INSTRUCTIONS

- Answer all questions
- Do not use red pen
- Please use a clear handwriting
- This exam is closed book, closed notes, closed laptop and closed cell phone
- Please use non-programmable calculators only

1. a) Show that $[p \rightarrow (q \wedge r)] \equiv [(p \rightarrow q) \wedge (p \rightarrow r)]$ 5mks

b) Let p, q and r be the propositions:

p: You have the flu

q: You miss the final examination

r: You pass the course

Express the following compound propositions as English statements

i. $q \rightarrow \neg r$ ii. $(p \wedge \neg q) \rightarrow r$ iii $\neg q \rightarrow r$ 3mks

c) Use the technique of Mathematical Induction to prove that

$1 + 2 + 3 + \cdots + n = \frac{n(n+1)}{2}, \; n \geq 1$ 7mks

2. a) Let **A= {x, y}** and **B= {1, 2, 3}** be sets. Find the following

i. $A \times B$ ii. $|B|$ iii. $P(A)$ iv. $P(B)$ v. $A \cup B$ 5mks

b) Consider the "divides" relation on the set $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$

i. Show that this relation is a partial order on A.

ii. Draw a Hasse diagram for the "divides" relation.

iii. List the maximum elements, minimum elements, greatest element and least element

10mks

3. a) Define the following terms:

i. Function ii. Injective Function iii. Surjective Function iv. Bijective Function v. Inverse Function 5mks

b) Let f and g be functions from the set of integers to the set of integers defined by $f(x) = 2x - 3$ and $g(x) = 3x - 4$. Find:

i. The composite $(f \circ g)(x)$

ii. The composite $(g \circ f)(x)$ 4mks

c) Use K-maps to minimize the following sum-of-products Boolean expressions

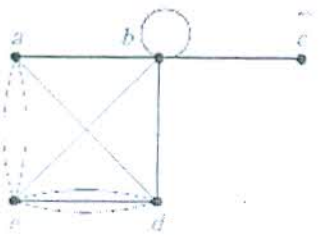
(a) $xy\bar{z} + x\bar{y}\bar{z} + \bar{x}yz - \bar{x}\bar{y}\bar{z}$

(b) $x\bar{y}z + x\bar{y}\bar{z} - \bar{x}yz + \bar{x}\bar{y}z + \bar{x}\bar{y}\bar{z}$ 6mks

4. a) Define the following terms:

i. Simple graph ii. Loops iii. Directed graph iv. Multigraph v. Degree of a vertex 5mks

b) Determine the degree of each vertex in the undirected graph below



10mks