(Knowledge for Development)

KIBABII UNIVERSITY

(KIBU)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

END OF SEMESTER EXAMINATION

2021/2022 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER EXAMINATION

FOR THE DIPLOMA IN

(INFORMATION TECHNOLOGY)

COURSE CODE: DIT 071

COURSE TITLE: DISCRETE MATHEMATICS

DATE: 20/05/2022 **TIME: 9.00 A.M. – 11.00 A.M.** **2HRS**

INSTRUCTIONS TO CANDIDATES:

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

Paper Consists of 3 Printed Pages. Please Turn Over.

QUESTION ONE (COMPULSORY) [24 MARKS]

a. Suppose U = N = {1, 2, 3...} is the Universal set. Let A = {1, 2, 3, 4}, B = {3, 4, 5, 6, 7}, C = {2, 3, 8, 9}, E = {2, 4, 6...} (Here E is the set of even integers.). Find:

i. E-A **[2 Marks]**

ii. A ∩ B∩ C **[2 Marks]**

iii. A ∪ B∪ C **[2 Marks]**

b. Given sets A= {1, 2, 3} and B= {1, 4}. Find:

i. the cross product of A and B **[2 Marks]**

ii. the cross product of B and A **[2 Marks]**

c. In a survey of 60 people, it was found that 25 read The Daily Nation. 26 read The Kenya Times and 26 read The Standard. Also 9 read both The Daily Nation and The Standard, 11 read both The Daily Nation and The Kenya Times, 8 read The Kenya Times India and The Standard and 8 are not reading anything. Expected:

i. Draw a Venn diagram **[8 Marks]**

ii. Find the number of people who read all three newspapers **[3 Marks]**

iii. Determine the number of people who read exactly one newspaper **[3 Marks]**

QUESTION TWO [18 MARKS]

a. Explain the differences between the following terms as used in discrete mathematics:

i. Proposition and predicate **[2 Marks]**

ii. Contradiction and Tautology **[2 Marks]**

b. Draw a truth table for the following propositional logic:

i. Exclusive Xor (p⊕q) **[3 Marks]**

ii. Biconditional (p↔q) **[3 Marks]**

c. Construct the Truth table for: $(p \rightarrow q) \equiv (\neg p \vee q)$ **[8 Marks]**

QUESTION THREE [18 MARKS]

a. Using Euclidean algorithm

i. find the GCD and LCM of 31415 and 1412. **[5 marks]**

ii. Find the value of x and y in **x** (31415) + **y** (1412) =gcd (31415, 1412) **[5 Marks]**

b. Prove by Direct proof that:

i. the sum of an even integer and an odd integer is odd. **[3 Marks]**

ii. the square of an odd integer is odd. **[3 Marks]**

iii. the sum of two even integer is even. **[2 Marks]**

QUESTION FOUR [18 MARKS]

a. Using relevant examples, distinguish between directed, undirected graph and multigraph. **[6 Marks]**

b. How many edges are there in a graph with 10 vertices, each of degree 6? **[6 Marks]**

c. Find the negation of the proposition p: $-5<x\leq 0$. **[6 Marks]**

QUESTION FIVE [18 MARKS]

a. Differentiate between the following concepts

i. Relation and Function **[2 Marks]**

ii. Permutation and combination **[2 Marks]**

b. Given the functions $f(x) = 2x^2 + 6$ and $h(x) = 4x - 9$. Find

i. The domain and the range of h(x) **[2 Marks]**

ii. f (2) **[2 Marks]**

iii. whether h(x) is one-to-one mapping **[1 mark]**

c. Let A= {1, 2, 3, 4, 6} and R be a relation of A defined by "x < y".

i. Write R as a set of ordered pairs. **[4 marks]**

ii. Draw its directed Graph. **[2 marks]**

iii. Find the inverse relation R^{-1} of R. can R^{-1} be described in words. **[2 marks]**