KIBABII UNIVERSITY

(KIBU)

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS
YEAR ONE SEMESTER TWO EXAMINATIONS

FOR THE DIPLOMA IN
(INFORMATION TECHNOLOGY)

COURSE CODE :   DIT071

COURSE TITLE :   DISCRETE STRUCTURES FOR IT

DATE: 21/06/2021   TIME: 2.00 P.M. – 4.00 P.M.

INSTRUCTIONS TO CANDIDATE

ANSWER **QUESTION ONE** AND **ANY OTHER TWO**

QUESTION ONE (COMPULSORY) **[24 MARKS]**

a. *Consider* sets A= {1, 2, 3, 4}, B= {3, 4, 5, 6, 7} and C= {2, 3, 5, 7}. Define:

[2 Marks]
   i. A∪B,

[2 Marks]
   ii. A∪C,

[2 Marks]
   iii. A∩B

[2 Marks]
   iv. A∩C

b. Let U = {1, 3, 5, 7, 9} be **a universal set and A and B are two sets such that** A= {3, 5}, B= {1, 3, 5}, A ⊆ B and B ⊆ U. Represent this information on a Venn diagram. **[5 Marks]**

c. Consider the following data for 120 University students concerning the languages they study:

   65 study French

   45 study German

   42 study Russian

   20 study French and German

   25 study French and Russian

   15 study German and Russian

   8 study all three languages

   Expected:

     i. Represent this information on a Venn diagram **[6 Marks]**

     ii. Find the Number of students who study at least a language **[3 Marks]**

     iii. Find the Number of students who Do not study any language **[2 Marks]**

QUESTION TWO **[18 MARKS]**

a. i. Using Euclidean algorithm 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 THREE **[20 MARKS]**

a. Give the universal set U representing the set of English alphabets, A a set of distinct elements of the word "**sycophants** ", B a set of distinct elements of the word "**surreptitious**" and C a set of distinct elements of the word "**generosity**". Find:

i. A-C [1 mark]

ii. $(A \cup B \cup C)^c$ [2 marks]

iii. $|A \cup B|$ [1 mark]

iv. $A \cap B$ [1 mark]

b. Of 100 students in a university department, 45 are enrolled in English, 30 in History, 20 in Geography, 10 in at least two of three courses and just 1 student is enrolled in all three courses.

i. Represent this information on a Venn diagram [4 marks]

ii. How many students take none of these courses? [2 marks]

c. The students who stay in hostel were asked whether they had a textbook and a digest in their rooms. The results showed that 650 students have text, 150 did not have a textbook, 175 had digest and 50 had neither a textbook nor a digest. Find:

i. The number of students in the hostel [4 marks]

ii. How many have both a textbook and digest [3 marks]

iii. How many have only a digest [2 marks]

QUESTION FOUR [20 MARKS]

a. Given sets A, B and C such that all are non-empty sets. State the inclusive- exclusive principle. [2 marks]

b. Write the predicate notation for the following statements:

i. Some students in Discrete Mathematics class smoke [2 marks]

ii. Jane loves anybody who is a musician and sings gospel [2 marks]

c. Give the $f(x) = \frac{x+1}{x^2}$, $g(x) = 4x^2 + 7$ and $h(x) = \frac{x^2-1}{x+1}$ find:

i. Domain and range of f(x) and h(x) [2 marks]

ii. The inverse $g^{-1}(x)$ of g(x) [3 marks]

iii. Is g(x) bijective? Explain. [2 marks]

iv. f(g(h(x))) [4 marks]

v. g(h(2)) [3 marks]

QUESTION FIVE [20 MARKS]

a. Using relevant examples differentiate between a function and a relation. [2 marks]

b. Let $A = \{2, 3, 4, 5\}$ and let $R = \{(2, 3), (3, 3), (4, 5), (5,1)\}$.Is R symmetric, asymmetric or antisymmetric? [2 marks]

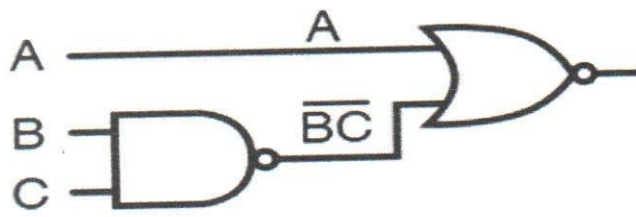c. Let $A = \{1, 2, 3, 4, 6\}$ and R be the relation on A defined by "x divides y", written an $x \mid y$.

i. Write R as a set of ordered pairs. [2 marks]

ii. Draw a directed graph of R. [2 marks]

iii. Write down the matrix of relation R. [2 marks]

iv. Find the inverse relation R–1 of R and describe it in words. [2 marks]

d. State the output of the following circuit. [3 marks]

A ————————— A
B ⊐D○ $\overline{BC}$ ⊐D○
C

In a computing class, we have 5 Information Technology candidates of which two are ladies and 7 computer science candidates of which 3 are ladies. Find the number of ways 3 official will be chosen from each class such that we has at least a female representative.   **[5 marks]**