



*(Knowledge for development)*

**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 : DIT 071**

**COURSE TITLE : DISCRETE MATHEMATICS**

**DATE: 08/10/2021      TIME: 2.00 P.M. - 4.00 P.M.**

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**INSTRUCTIONS TO CANDIDATE**

**ANSWER QUESTION ONE AND ANY OTHER TWO**

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

a. 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

i. Represent this information on a Venn diagram

**[6 Marks]**

Find:

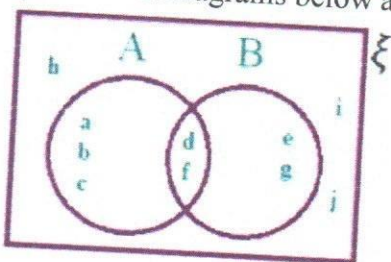
ii. Number of students who study at least a language

**[3 Marks]**

iii. Number of students who Do not study any language

**[2 Marks]**

b. Study the Venn diagrams below and use it to find the following sets.



i.  $A \cup B$

**[1 Mark]**

ii.  $A \cap B$

**[1 Mark]**

iii.  $A'$

**[1 Mark]**

iv.  $B - A$

**[2 Marks]**

v.  $(A \cap B)'$

**[2 Marks]**

vi.  $(A \cup B)'$

**[2 Marks]**

c. Using appropriate examples, state TWO ways in which sets can be represented in set theory.

**[2 Marks]**

d. Differentiate between singleton set and disjoint set. Provide an example in each case.

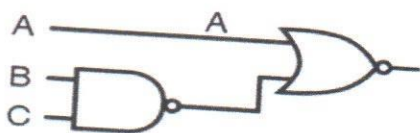
**[2 Marks]**

**QUESTION TWO [18 MARKS]**

- a. Differentiate between the following concepts [4 marks]  
 Relation and Function  
 Permutation and combination
- 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.  $f(2)$  [3 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]

**QUESTION THREE [18 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 as  $x | y$ .
- 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]



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 officials will be chosen from each class such that we have at least a female representative. [5 marks]



**QUESTION FOUR [18 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.  $(A \cup B \cup C)^c$  [2 marks]
  - ii.  $|A \cup B|$  [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 FIVE [18 MARKS]**

- a. Use the Euclidean algorithm to compute the greatest common divisor  $\text{GCD}(1679; 173)$ . Otherwise, compute the least common multiple  $\text{LCM}(1679; 173)$ . [4 marks]
- b. A student council is composed of 16 members of which 9 are men and 7 women. Find the number  $n$  of ways to:
- i. Select a 4-member committee from the students. [3 marks]
  - ii. Select a 4-member committee with 2 men and 2 women. [3 marks]
  - iii. Elect a president, vice president, and treasurer. [3 marks]
  - iv. Prove by Direct proof that:
    - i. the sum of an even integer and an odd integer is odd. [3 Marks]
    - ii. the sum of two even integer is even. [2 Marks]