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(Knowledge for development)

KIBABII UNIVERSITY

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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: 21/01/2022 TIME: 8.00 A.M. - 10.00 A.M.

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

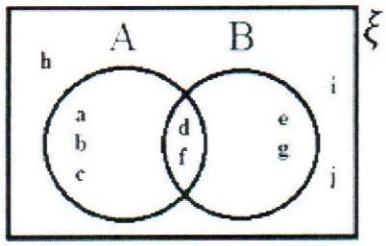
i. Represent this information on a Venn diagram **[6 Marks]**

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 an $x \mid y$.

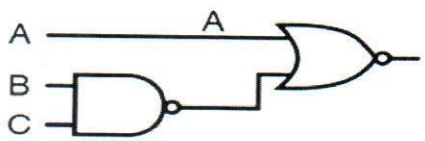
i. Write R as a set of ordered pairs. **[2 marks]**

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]**



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]**

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 GCD (1679; 173). Otherwise, compute the least common multiple 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]**