(Knowledge for Development)

KIBABII UNIVERSITY

(KIBU)

UNIVERSITY EXAMINATIONS
2019/2020 ACADEMIC YEAR

SUPPLEMENTARY/SPECIAL EXAMINATIONS
YEAR TWO SEMESTER ONE EXAMINATIONS

FOR THE DEGREE OF
BACHELOR OF SCIENCE
(INFORMATION TECHNOLOGY)

COURSE CODE : **DIT 074 071**

COURSE TITLE : **DISCRETE MATHEMATICS**

DATE: 17/02 /2021 **TIME: 11.00 A.M. – 1.00 P.M.**

INSTRUCTIONS TO CANDIDATES

ANSWER **QUESTIONS ONE AND ANY OTHER TWO.**

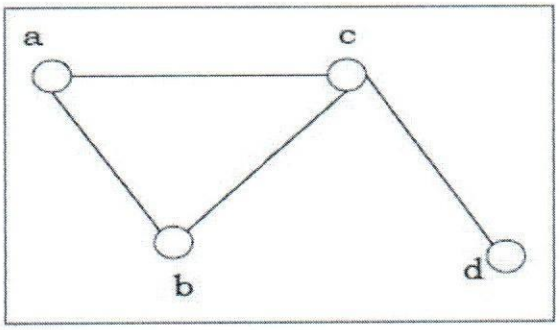
SECTIONA

QUESTION ONE (24marks)

a)i) What is a Graph? 2marks ii) Briefly explain at least 3 types of graphs 3marks iii)

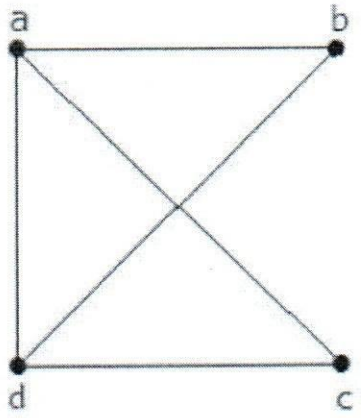
Explain the 4 applications of Graphs 4marks

b)What is the degrees and neigbhoods of the vertices in the graph G?4marks



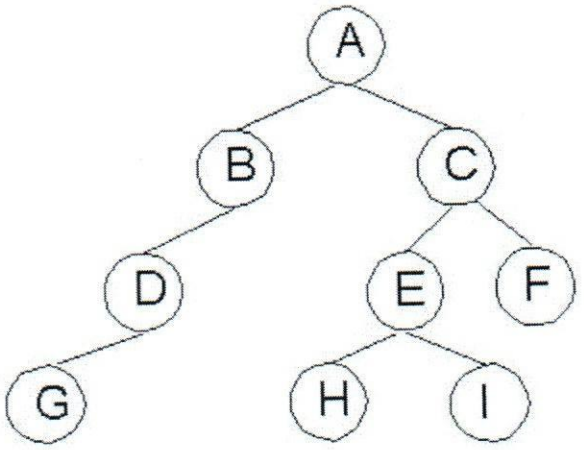
G

c)Given graph H,What is its adjacency matrix ? 3marks



H

d)Using traversal methods in the tree below ,give the Preorder,Inorder,Postorder and Levelorder. 8marks



SECTION B

QUESTION TWO (18marks)

a) Construct a truth table for the following statement form: 5marks

$p \vee (q \wedge (\neg p)) \leftrightarrow (\neg q) \rightarrow p)$

b) i)Write down the negation of the following statement: $\forall x \exists y (x = -y)$ 2marks

ii) Translate the following statement into English. $\forall x (C(x) \vee \exists y (C(y) \wedge F(x, y)))$ 2marks

C(x): x has a computer.

F(x,y): x and y are friends.

Domain of x and y: all students

c)Set A,B and C and are given by A={1,x.3},B={3,β,y}, C={1,3}

Complete the following: 5marks

i) $B \cup C =$

ii) $A \cap B=$

iii) iii) $|A \cap B|=$

iv) iv) Prove that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

d) Write the following statements in the form "If....then..." 4marks

i) It is necessary for Alice to count ten in order for her to remain calm.

ii) It is sufficient for John to take an umbrella in order to keep the rain away.

QUESTION THREE (18marks)

A Committee of five is to be chosen from a collection of 4 women and 8men.

a) How many different committees of five people can be formed? 5marks

b) How many different committee of five can be formed, if at least 2 men and at least 2 women are to be formed on the committee of five? 5marks

c) What is the probability that there are exactly 3women and 2men chosen, given that the constraints in part (b) hold? 3marks

d) In a class 40% of the students enrolled for Math and 70% enrolled for Computer science. If 15% of the students enrolled for both Math and Computer science, what % of the students of the class did not enroll for either of the two subjects?
Represent your answer using Venn diagram. 5marks

QUESTION FOUR (18marks)

a) Show that if x is a non-zero real number such that $x + \frac{1}{x} < 2$, then $x < 0$ by

(i) Using a direct proof. 5marks

(ii) Using a proof by contradiction. 5marks

b) Use mathematical induction to prove that $4^n+7<5^n$ for all integers $n \geq 2$. 3marks

c) With the help of an example briefly explain the difference between Combination and permutation in counting principle. 5marks

QUESTION FIVE (18marks)

a)If $f(x) = x - 3$ and $g(x) = 4x^2 - 3x - 9$.

Find i) $g(2)$ 2marks

ii) Inverse $f^{-1}(x)$ 2marks

iii)$fog(x)$ 2marks

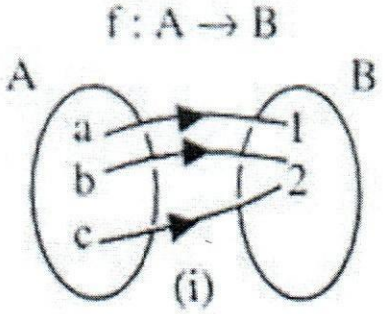
b) Given $f(x) = x^2 - x - 4$. If $f(k) = 8$, what is the value of k? 2marks

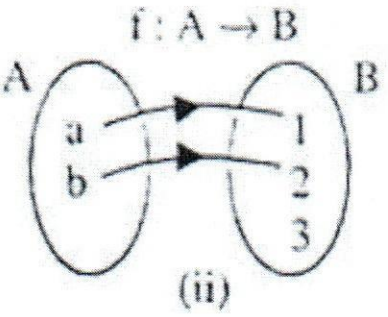
c) i)Find the range of $f(x) = |x - 2| + 3$ 3marks

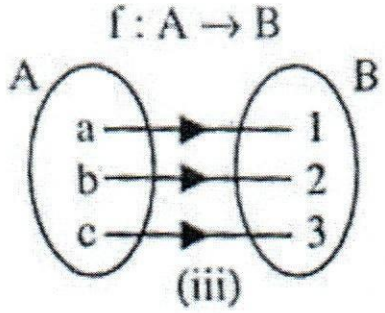
ii) Draw the graph of the following 2marks

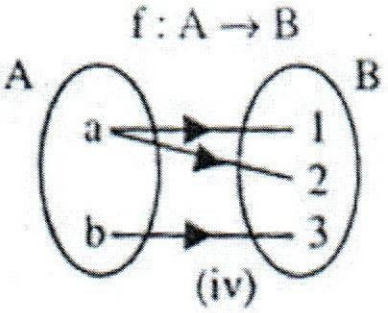
$f(x) = -x+3$

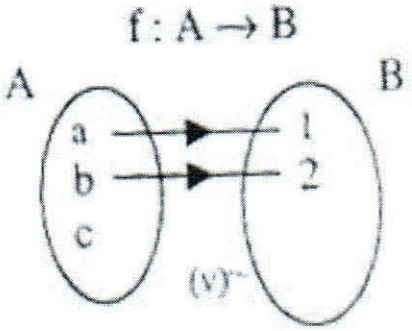
d)Classify the following functions 5marks


f : A → B
A
B
a
b
c
1
2
(i)


f : A → B
A
B
a
b
1
2
3
(ii)


f : A → B
A
B
a
b
c
1
2
3
(iii)


f : A → B
A
B
a
b
1
2
3
(iv)


f : A → B
A
B
a
b
c
1
2
(v)