



FOUNTAIN UNIVERSITY OSOGBO, NIGERIA

P.M.B.4491, OSOGBO, OSUN STATE.

COLLEGE OF NATURAL AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICAL AND COMPUTER SCIENCES

SECOND SEMESTER EXAMINATION 2018/2019 SESSION

CPS 204: DISCRETE STRUCTURES

Credit Unit/Status: 2 (C)

Time Allowed: 1Hr.45mins

29/06/2019

INSTRUCTION(s): ANSWER QUESTION1 AND ANY OTHER TWO (2) QUESTIONS.

Question 1

- a. As a student studying Computer Science in Fountain University, What is the relevance of this course titled "Discrete Structures" to your course of study? **[3mark]**
- b. Given a set of elements "A", what does a relation on that Set means. **[5mark]**
- c. For each of the following, decide whether the statement is true or false, and justify your assertion: **[6mark]**
 - i. If p is true, q is false and r is false, then $p \vee (q \wedge r)$ is true.
 - ii. The sentence $(p \leftrightarrow q) \leftrightarrow (q \leftrightarrow p)$ is a tautology.
 - iii. The sentences $p \wedge (q \vee r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent. **[3mark]**
- d. Translate the following statements into logical expressions: **[4mark]**
 - i. You can access the FUO internet from Campus only if you are a computer major, or you are not a fresh student.
 - ii. If you work hard, then you will be rewarded.
 - iii. What is the truth value of the proposition in 1d (i)?
 - iv. Determine whether or not 1d (ii) is logically equivalent to "If you will not work hard, then you will not be rewarded".
- e. Write the set builder notation for the following sets of numbers: N, R, Q and Z. **[4mark]**

Question 2

- a. Given the statement "I don't drink and drive":
 - i. Is this a compound proposition? If yes, Give its atomic propositions. **[1mark]**
 - ii. Express the propositional statement in propositional logic. **[1mark]**
 - iii. Write the negation of the logical expression and translate the negation into English. **[1.5mark]**
 - iv. Prove or otherwise if proposition in (a) is logically equivalent to "If I drink, then I don't drive ". **[3mark]**
- b. What do you understand by Equivalence relation? **[3mark]**
- c. Let R be the relation $\{(a, b) \mid a - b = 3k\}$ for some $k \in \mathbb{Z}$.
 - i. Determine with proof, whether R is an equivalence relation? **[4mark]**

- ii. If yes, what is the equivalence class of the set defined in (i) above?
[4mark]

Question 3

a. What is a partition of a set? Give examples. [5mark]

b. Let S be a non-empty set, and let $P(S)$ denote the set of all S (i.e. power set of S), $P(S) = \{A \mid A \subseteq S\}$. The relation R on $P(S)$ is defined by:

$$R = \{(A, B) \mid A, B \in P(S) \text{ and } A \subseteq B\}$$

Determine with proof whether is reflexive, symmetric and transitive.

[6mark]

c.

$$M_R = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$

i. Find the matrix representing R^2 of the M_R given above.

[3mark]

ii. Give the relation R of the M_R given in (c) above.

[1.5mark]

iii. Obtain the diagram of the relation obtained in c (ii).

[2mark]

Question 4

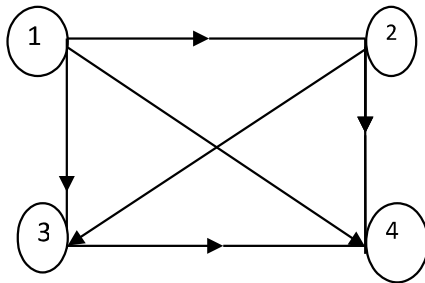
a. Show by constructing truth tables or otherwise, that the following propositions are logically equivalent. [6mark]

i. $p \Rightarrow q$ and $\sim (\sim p \wedge q) \wedge p$.

ii. $(p \Rightarrow r) \wedge (q \Rightarrow r)$ and $(p \vee q) \Rightarrow r$.

b. Show, by the Element method and Venn diagram method that, for all subsets P , Q , and R of U , $(P - Q) \cap (R - Q) = (P \cap R) - Q$. [6mark]

c. Determine whether the relation for the diagram shown below is reflexive, symmetric, antisymmetric and /or transitive. [3mark]



d. Using the relation obtained in (c), represent the relation in form of M_R .

[2.5mark]