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 2019/2020 SESSION

CPS 204: DISCRETE STRUCTURES **Credit Unit/Status: 2 (C)**

Time Allowed: 1hr 45mins 21/09/2020

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

Question 15

a. Given a set of elements denoted as "A", what does a relation on 'A' means? **[4mark]**

b. Translate the following statements into logical expressions: **[8mark]**

i. You can partake in the FUO mock examination only if you have paid your School fees, and you partake in the online classes.

ii. If you work hard, then you will be rewarded.

iii. If you do not partake in the online examination, then you fail the course.

iv. What is the truth value of the proposition in **1c (i)**?

v. Determine whether or not **1c (ii)** is logically equivalent to "If you will not work hard, then you will not be rewarded".

c. Give the set builder notation for the following sets of numbers: N, R, Q and Z**.** **[4mark]**

d. Consider the relation R = {(1,1),(1,3),(1,4),(2,1),(2,2),(3,1), (3,3),(3,4),(4,1),(4,3) (4,4)}.

i. Find the domain and range of R. **[4mark]**

ii. Find the matrix of the relation R. **[2mark]**

iii. Give the digraph of the relation R. **[3mark]**

Question 2

a. Given a conditional statement in English: **[8mark]**

"If I pass CPS 204 course, then I can register for CPS 307."

i. Translate the sentence into a logical expression write the negation of the logical expression and translate the negation into English.

ii. Write the converse of the logical expression and translate the converse into English.

iii. Write the inverse of the logical expression and translate the inverse into English.

iv. Write the contrapositive of the logical expression and translate the contrapositive into English.

b. What you understand by Equivalence relation? **[4½ mark]**

c. If A = {2,4,6}, B = {3,5,8,10}. Define relation **R** and **S** from A to B as follows:

*(x,y) ∈ A X B, x**R**y iff y/x (**x divides y**) and (x,y) ∈ A X B, x**S**y iff y-4 = x.*

i. List all the elements of *A X B*, R, S, R ∪ S and R ∩ S **[5mark]**

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 | 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. **[5mark]**

c. Given the matrix of relation M_R as shown below:

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

i. Give the relation of the M_R given above. [**2mark]**

ii. Determine with proof whether M_R is reflexive, symmetric and transitive. **[3mark]**

iii. Find the matrix representing R^2 of the M_R given above. [**2 ½ mark]**

Question 4

a. Represent the statement below in propositional functions and quantifiers [**10 mark]**

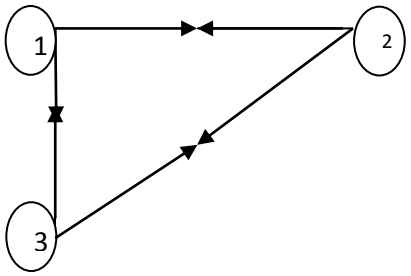
i. Nobody is perfect.

ii. At least one FUO Student is a genius.

iii. All FUO Professors are genius.

iv. Some Computer Science Students do not know how to write Computer programs.

b. Determine whether the relation for the diagraph shown below is reflexive, symmetric, antisymmetric and /or transitive. [**5mark]**



c. Represent the relation obtained in (b) in form of M_R. [**2½mark]**

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