# 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 2017/2018 SESSION

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

**Time Allowed: 1Hr.45mins** 21/07/2018

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

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*Question 1*

a. What is the relevance of Discrete Structures to Computer Science studies? **[4%]**

b. Given a set A, explain a relation on a set A. **[5%]**

c. For each of the following, decide whether the statement is true or false, and justify your assertion: **[8%]**

   i. If p is true and q is false, then $p \wedge q$ is true.

   ii. If p is true, q is false and r is false, then $p \vee (q \wedge r)$ is true.

   iii. The sentence $(p \leftrightarrow q) \leftrightarrow (q \leftrightarrow p)$ is a tautology.

   iv. The sentences $p \wedge (q \vee r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent.

d. List the elements of each of the following sets: **[4%]**

   i. $\{x \in N : x^2 < 45\}$

   ii. $\{x \in Z : x^2 < 45\}$

   iii. $\{x \in Z : x^4 = 1\}$

   iv. $\{x \in N : x^4 = 1\}$

e. Represent the following propositional statements using universal and existential quantifiers. **[8%]**

   i. Nobody is perfect.

   ii. At least one FUO professor is a genius.

   iii. Not all roses are red

   iv. Every even number is a sum of two odd numbers.

*Question 2*

a. Given the statement "I don't drink and drive":

   i. Is this a compound proposition? If yes, Give its atomic propositions. **[1.5%]**

   ii. Express the propositional statement in propositional logic. **[1%]**

   iii. Prove or otherwise if proposition in (a) is logically equivalent to " If I drink, then I don't drive ". **[3.5%]**

b. What do you understand by equivalence relation? **[2%]**

c. Let R be the relation $\{(a, b) \mid a \quad b \pmod 5\}$ on the set of integers.

   i. Determine with proof, whether R is an equivalence relation?. **[3%]**

   ii. What is the equivalence class of the set defined in (i) above? **[4%]**

*Question 3*

a. What is a partition of a set? Give examples. **[4%]**

b. Determine the relative salaries of Dr Shittu (S), Mr Lawal(A) and Mrs Ogunrinde (O) from the following? **[5%]**

i. If A is not highest paid, then S is.

ii. If S is not lowest paid, then O is highest paid.

c.

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

i. Find the matrix representing $R^2$ of the $M_R$ given above. **[3%]**

ii. Give the relation R of the $M_R$ given in (c) above. **[1%]**

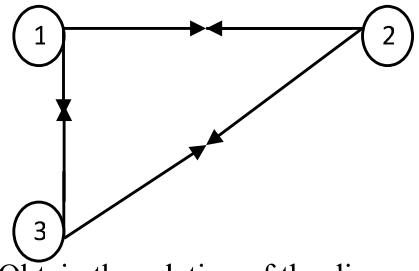
iii. Obtain the diagraph of the relation obtained in c(ii). **[2%]**

*Question 4*

a. Show by constructing truth tables or otherwise, that the following statements are equivalent. p => q and ~ ( ~p Λ q) Λ p. **[5%]**

b. What do you understand by directed graph? **[3%]**

c.




i. Obtain the relation of the diagraph given in (c) above : **[2%]**

ii. Show that the relation in b(i) above is reflexive, symmetric, antisymmetric and /or transitive ? **[3%]**

iii. Using the relation obtained in b(i), represent the relation in form of a matrix. **[2%]**