FOUNTAIN UNIVERSITY, OSOGBO, Nigeria.

P.M.B 4491, OSOGBO, OSUN STATE

COLLEGE OF NATURAL AND APPLIED SCIENCES
DEPARTMENT OF MATHEMATICAL AND COMPUTER SCIENCES
2016/2017 SECOND SEMESTER EXAMINATIONS

CPS 204: Discrete Structures **Credit Unit (Status): 2 (C)**
Time Allowed: 2.00 Hr. **09/06/2017**
Instructions: Answer question 1 and attempt 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.?
b) Using proof techniques, demonstrate that $[\neg p \quad (p \quad q)] \quad q$ is a tautology.
c) Find the Cartesian products of two sets A and B.
d) Write the set builder notation for the following sets of numbers: N, R, Q and Z**.**
e) Given a set A, explain a relation on a set A.
f) Explain reflexive, symmetric and transitive relation on a set A.

[30 marks]

Question 2

a) If you miss the final exam, then you fail the course."
   i. Express this propositional statement in propositional logic.
   ii. Prove or otherwise if proposition in (a) above is logically equivalent to "If you do not miss the final exam, then you pass the course"
b) What is a partition of a set? Give examples.
c) Let R be the relation $\{(a, b) \mid a \quad b \pmod 3\}$ on the set of integers.
   i. Determine with proof, whether R is reflexive, symmetric and /or transitive.
   ii. What is the equivalence class of the set defined in (iii) above?

[20 marks]

Question 3

a) Can you determine relative salaries of D (Dr_Shittu), A(Mr_Azeez) and O(Mrs_Ogunrinde) from the following?
   i. If O is not highest paid, then D is.
   ii. If D is not lowest paid, then A is highest paid.
b) Suppose that A is a non-empty set, and f is a function that has A as its domain. Let R be the relation on A consisting of all ordered pairs (x,y) where $f(x) = f(y)$ meaning that x and y are related if and only if $f(x) = f(y)$. Show that R is an equivalence relation on A.
c) Show that the M_R given below is a symmetric relation.

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

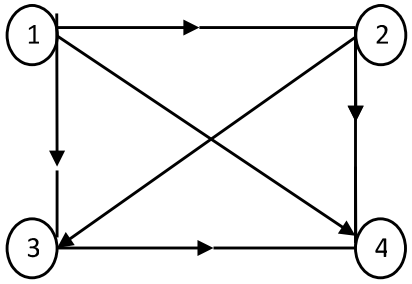
[20 marks]

Question 4

a) Represent the following propositional statements using universal and existential quantifiers.
   i. Not all roses are red.
   ii. Nobody is perfect.
   iii. At least one FUO student is a genius.
   iv. All FUO professors are genius.

b)i. What do you understand by directed graph?

ii. Determine whether the relation for the diagraph shown below is reflexive, symmetric, antisymmetric and /or transitive.



c) Using the relation obtained in b(ii), represent the relation R in form of M_R.

[20 marks]