

BOWEN UNIVERSITY, IWO
COLLEGE OF COMPUTING AND COMMUNICATION STUDIES
SOFTWARE ENGINEERING PROGRAMME
B.Sc. SECOND SEMESTER PROGRAMME EXAMINATION 2022/2023 SESSION
COURSE CODE: SEN 204 COURSE TITLE: LOGIC AND ITS APPLICATIONS
COURSE CREDIT: 3 DATE: /06/23 DURATION: 2HOURS 30MINUTES
INSTRUCTION: Answer any four (4) questions

QUESTION One

- (a) Define the following terms (i) Logic Programming and (ii) Functional Programming; also state the difference between the two. **(10marks)**
- (b) What do you understand by a Prolog and briefly state the different elements found in a Prolog language. **(7.5marks)**
- (c) Briefly explain the basic semantics that occurs in a Propositional Logic; also state its importance to computer science **(7.5marks)**

QUESTION Two

- (a) Explain when a deductive argument is said to be the following underlined concept below:
i. Invalid argument form
ii. Valid argument form
iii. Sound argument **(5.5marks)**
- (b) Define Logic gates and with two input signal combinations, describe the working principles of “AND”, “OR” and “EX-OR” gates using schematic diagrams and truth tables. **(9marks)**
- (c) Briefly describe a formal deduction and also state the various processes needed for conducting it. **(10.5marks)**

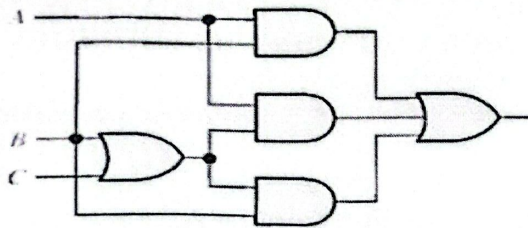
QUESTION Three

- (a) With an illustrative example explain what you understand by Truth Tables and briefly define Boolean Algebra. **(7marks)**
- (b) Design a logic circuit that has three inputs, A, B, and C, and whose output will be HIGH only when a majority of the inputs are HIGH. **(10marks)**
- (c) Briefly explain the types of logic circuitry and also state the working principle of a multiplexer. **(8marks)**

QUESTION Four

- (a) An assembly line has 3 fail safe sensors and 1 emergency shutdown switch. The line should keep moving unless any of the following conditions arises which are:
- If the emergency switch is pressed.
 - If sensor 1 and sensor 2 are activated at the same time.
 - If sensor 2 and sensor 3 are activated at the same time.
 - If all three sensors are activated at the same time.
- Hence derive the truth table for this system from the above assumptions. **(8marks)**

- (b) Design, using Karnaugh Map techniques, a minimum AND-OR gate network for this system and draw the resulting digital circuit diagram. **(9marks)**
- (c) Reduce the combinational logic circuit below to a minimum form. **(8marks)**



QUESTION Five

- (a). Explain the following terms:

- (i) Predicate Logic
- (ii) Propositional Logic

(5marks)

- (b) With the aid of examples explain the rules of formal deduction.

(10marks)

- (c) With the following underline premise or statements, translate this statements to a propositional logic using the variable p, q, r, s, t:

- It is not the case that Bowen University, Iwo is not a Private University.
- Bowen University, Iwo is a Private University and it is not the case that it is Public University.
- Ayo is a lecturer in computer science or Bowen University, Iwo is a Private University or it is a Public University.
- It is a Public University equivalent to Ayo is a lecturer in computer science. **(4marks)**

- d) Declare p, q, r, s, t as declarative sentences and translate this to English:

- $(p \leftrightarrow q)$
- $\neg(p \rightarrow \neg s)$
- $((q \wedge p) \rightarrow t)$
- $(\neg r \wedge \neg p)$

(6marks)

QUESTION Six

- (a) Explain what you understand by Karnaugh Maps and state four (4) rules that is needed for Karnaugh map grouping. **(9marks)**
(b) Determine the product terms for each of the Karnaugh maps below and write the resulting minimum SOP expression.

$\begin{matrix} C \\ AB \end{matrix}$	0	1
00	1	
01		1
11	1	1
10		

$\begin{matrix} C \\ AB \end{matrix}$	0	1
00	1	1
01	1	
11		1
10	1	1

$\begin{matrix} CD \\ AB \end{matrix}$	00	01	11	10
00	1	1		
01	1	1	1	1
11				
10		1	1	

$\begin{matrix} CD \\ AB \end{matrix}$	00	01	11	10
00	1			1
01	1	1		1
11	1	1		1
10	1		1	1

(8marks)

(c) Explain the most common types of Prolog that you know.

(8marks)