FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

SECOND SEMESTER EXAMINATION 2019/2020 SESSION

COURSE TITLE: DIGITAL ELECTRONICS
COURSE CODE: ITE 562
TIME ALLOWED: 2HOURS

INSTRUCTION: ATTEMPT A TOTAL OF FOUR QUESTIONS, QUESTIONS ONE AND TWO ARE COMPULSORY

Q1a. State the main stages to creating a logic expression using karnaugh map.

b. Develop a truth table for each of the following expressions: (i) $X=\bar{A}\bar{B}C+A\bar{B}\bar{C}+ABC$. (ii)$X=\bar{A}BC+A\bar{B}\bar{C}$.

c. use karnaugh maps to minimize the following expressions

(iii)$G = \bar{A}\bar{B}\bar{C}\bar{D}+\bar{A}\bar{B}\bar{C}D+\bar{A}B\bar{C}D+\bar{A}BC\bar{D}+AB\bar{C}\bar{D}+A\bar{B}\bar{C}D+A\bar{B}C\bar{D}+ABC\bar{D}+A\bar{B}CD+ABCD$

(iv) $F = \bar{A}\bar{B}\bar{C}\bar{D}+\bar{A}\bar{B}\bar{C}D+\bar{A}B\bar{C}\bar{D}+\bar{A}B\bar{C}D+ABCD+ABC\bar{D}$

Q2a. Prove the following Boolean expressions

(i) $A+\bar{A}B = A+B$ (ii) $A+AB = A$ (iii) $(A+B)(A+C) = A+BC$

b. prove the expression in question 2a(iii) above by means of truth table

c. simplify the following expressions

(i) $AB+A(B+C)+B(B+C)$ (ii) $AB+AC+ABC$.

Q3a. Convert the following binary numbers to hexadecimal

(i) 1100101001010111 (ii) 1111110001011010 01

b. Convert the following hexadecimal numbers to binary

(i) $10A4_{16}$ (ii) $CF8E_{16}$ (iii) 9742_{16}

Q4a. Implement the following circuits (i) $X=AB+CDE$ (ii) $X=AB(CD+EF)$ (iii) $X=\bar{A}BCD+A\bar{B}EF$ (iv) $X=\bar{A}BC+A\bar{B}C+AB\bar{C}$

b. Construct logic circuits using AND, OR and NOT gates for the following expressions

(i) $X= (ABC)C + ABC + D$ (ii) $X= \bar{A}BCD+A\bar{B}CD+AB\bar{C}D+ABC\bar{D}$

Q5. Explain the following terms

(a)Logic probe (b) Flip-flop (c) Transistor-transistor logic (d) Complementary metal oxide semiconductor (e) The set-reset latch (f) Min-term (g) Max-term