FEDERAL UNIVERSITY OF TECHNOLOGY
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION
SECOND SEMESTER EXAMINATION 2017/2018 SESSION

COURSE TITLE: DIGITAL ELECTRONICS

COURSE CODE: IET 522
TIME ALLOWED: 2HOURS

INSTRUCTION: ATTEMPT FOUR QUESTIONS ONLY

Q1a. State the main stages to creating a logic expression using karnaugh map
   b. Draw karnaugh maps for the following expressions and obtain a simplified expression for the maps:

$$X = \overline{A}\overline{B}\overline{C}\overline{D}+\overline{A}\overline{B}C\overline{D}+\overline{A}BC\overline{D}+\overline{A}B\overline{C}\overline{D}+AB\overline{C}\overline{D}+A\overline{B}\overline{C}\overline{D}+A\overline{B}\overline{C}D+A\overline{B}CD+A\overline{B}C\overline{D}+ABCD$$

$$X = \overline{A}\overline{B}\overline{C}\overline{D}+\overline{A}\overline{B}C\overline{D}+\overline{A}\overline{B}C\overline{D}+\overline{A}\overline{B}C\overline{D}+ABCD+ABC\overline{D}$$

Q2a. Convert the following binary numbers to hexadecimal
         (i) 1100101001010111 (ii) 1111110001011010
   b. Design a logic circuit to implement the following expressions:
 (i) X= ($\overline{A}B\overline{C}$) (B+C) + A$\overline{B}$C. (ii) X= $\overline{A}$BC + A$\overline{B}$C + AB$\overline{C}$
(iii) X=ABCD +ABCD+ABCD+ABCD

Q3a. Prove the following Boolean expressions by means of truth table
         (i) A+$\overline{A}$B = A+B (ii) A +AB = A (iii) (A+B)(A+C) = A+BC
   b. Simplify the following expressions
         (i) AB+A(B+C) +B(B+C) (ii) AB+AC+ABC.

Q4a. Define and state the truth table of the following logic gates: (i) AND (ii) OR (iii) NOT
         (iv) NAND (v) NOR (vi) XOR (vii) XNOR
   b. State six advantage of digital systems over analogue

Q5a State the difference between TTL, ECL and CMOS logic families with regards to their design rules, power consumption and speed
   b. Draw the logic symbols of 4-input AND and 4-input NOR gates and present their respective truth tables