University of Technology

Computer Science Dept.

Date: / / 2017

Time: **3 hours**

Examiner: ***Enas Tariq***

Second Trial

2016-2017

Subject: **Logic Design**

Class: **1st**

Note: Answer six questions.

Q1/ Answer two only

a) Prove X+ 1 = 1?

b) Simplify the following using Demorgan theorem:

$$Y = ABCD + ABCD + ABCD + ABCD + ABCD + ABCD + ABCD$$

c) Simplify the following Boolean expression:

$$Y = \overline{AB + AC} + \bar{A}\,\bar{B}C$$

Q2/ Simplify using Karnaugh map of the following function: (**Choose One**)

1) $F(A, B, C, D) = AB + ABC + ABCD + ACD + ABCD$

2) $F(A, B, C, D) = \bar{A}\,\bar{B}\,\bar{C} + \bar{A}\,B + A\,B\,\bar{C} + AC$

Q3/ Answer the following: (**Choose two only**)

a) Using NAND gates only to implement the function:

$$F(A, B) = AB + (A + C)(B + C)$$

b) Determine the truth table and logic diagram of the function:

$$F(X, Y, Z) = X + \bar{Y}Z + Y\bar{Z}$$

Q4/Design **one** of the following:

a) Two 2*4 decoders with enable inputs connected to form a 3*8 decoder.

b) Binary-to-octal line decoder or design 3-to-8 lines decoder.

Q5/ Answer the following: (Choose two)

a) Implement 4-bit synchronous up counter.

b) Design J. K. flip-flop.

c) Design 4-to-1 line multiplexer with truth table.

Q6/ Answer the following:

a) Design Full Adder using Half Adders with truth table.

b) Design 4-bit shift register, and write wave, when the input is 10001.

Q7/ Draw the 4-bit parallel adder, find the sum and output carry for the addition of the following two 4 bit numbers if the input carry (Cn-1) is 0:

A4A3A2A1=1110, B4B3B2B1=1010