National University

of Computer and Emerging Sciences Chiniot-Faisalabad Campus

EE1005 – Digital Logic Design
Quiz# 2

Instructor: Muhammad Adeel Tahir
Sections: BCS-2F
Time: 60 Minutes
Name: _____
Roll No: _____ **Total Marks: 50**

Instructions:

- Read each question carefully; marks will be deducted for not meeting the requirements.
- **Scientific calculators** are **not permitted** during the quiz.
- Marks for each question are indicated alongside the question.

Question 1: Solve the following parts of the questions carefully. [12 marks]

a. Convert the sequence from 60_{10} , 61_{10} to Gray code. Show proper working or no marks will be given **(2+2=4)**

b. Convert the following into BCD code and add: 295 + 157 **(2)**

c. In an 8-bit two's-complement system, what decimal number does the bit pattern **10000111** represent? Show proper steps in finding the actual decimal number. **(2)**

d. One of the following bit patterns is valid BCD (binary-coded decimal), but the other one is not, Which one is not valid? For credit to be given, you must give a correct reason. **(1)**

1. **100110110100**
2. **100100111000**

_____

_____

What number does the valid bit pattern from part (d) represent? Give your answer in base ten. **(1)**

_____

e. The *ten-bit* Gray code for $(\mathbf{353})_{10}$ is **0111010001**. Explain briefly but precisely why it cannot be true that **0111010100** is the ten-bit Gray code for $(\mathbf{354})_{10}$ **also** calculate gray code for 35410. **(2)**

Reason:_____

_____

_____

_____

Gray code for 35410: _____

Question 2: Solve the following problems, show proper working. [15 marks]

a. Using 10's complement. subtract 72532 - 3250. **(2)**

b. Given the two binary numbers **X = 1010100** and **Y = 1000011** perform the subtraction

i) X - Y and **(2)**
ii) Y - X by using 2's complements. **(2)**

c. Simplify the given Boolean expressions, and specify the laws used for each step within brackets where the question does not specifically mention which laws to be used. **Note**: If the laws used are not mentioned, the question will receive zero marks even if the answer is correct. **(4)**

i) $[\mathbf{A}\overline{\mathbf{B}}(\mathbf{C}+\mathbf{BD})+\overline{\mathbf{A}\,\mathbf{B}}]\,\mathbf{C}$

ii) Apply Demorgan's theorem to the following expressions: **(1+1+1=3)**

a. $\overline{\overline{(\mathbf{A}+\mathbf{B})}+\overline{\mathbf{C}}}$

b. $\overline{(\overline{\mathbf{A}}+\mathbf{B})+\mathbf{CD}}$

c. $\overline{(\mathbf{A}+\mathbf{B})\overline{\mathbf{C}}\,\overline{\mathbf{D}}+\mathbf{E}+\overline{\mathbf{F}}}$

iii) Taking the Boolean expression of **Exclusive OR Gate as starting point**. Use any rules or laws that are applicable to **develop an expression for the exclusive-NOR gate**. **(2)**

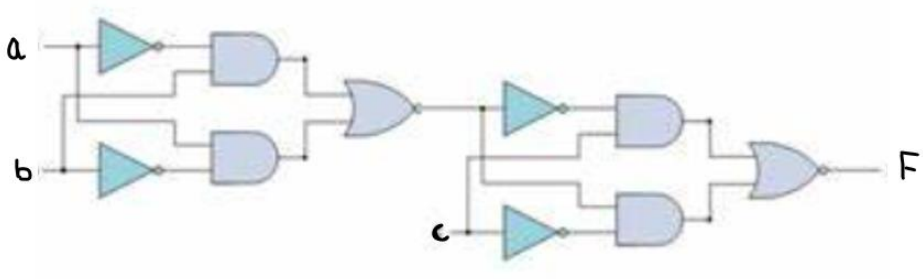
Working:

Q3: Given the following circuit below, Solve the given parts carefully. [10]

a) Derive the Boolean expression from the following circuit diagram. Make sure you label each output carefully in neat and clean handwriting (**on the diagram)** to score the maximum marks. Write your final answer in the space provided. **(5)**

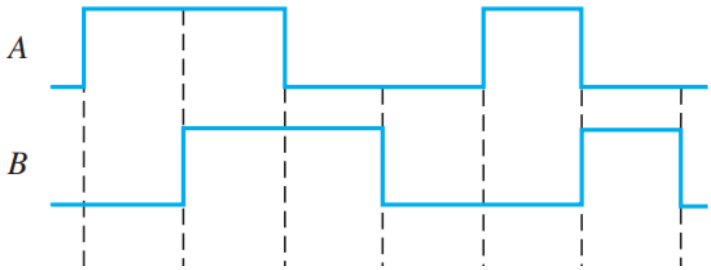
b) Draw the truth table of the derived equation. **(5)**

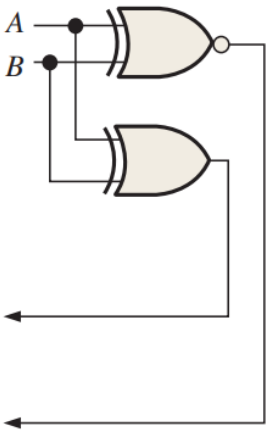
F = _____



Truth Table:

Q:4 Determine the output time diagram (waveform) for the XOR gate and for the XNOR gate, given the input waveforms, A and B, in Figure given below. (5)





XOR

XNOR

Q5: Convert the hexadecimal to base-7. Proper working must be shown. (2.5+2.5=5)

$(9A3.F)_{16}$

Q:6 Choose the correct answer **[3 marks]**

1) Which of the following is a characteristic of Gray Code?
a) Only one bit changes at a time
b) It is a weighted code
c) It is a decimal to binary code
d) All of the above
2) What is the range of 8-bit signed binary numbers?
a) -128 to 127
b) 0 to 255
c) -256 to 255
d) -127 to 128
3) Which of the following gates is known as an inverter?
a) AND gate
b) OR gate
c) NOT gate
d) NAND gate