RAMAIAH UNIVERSITY
OF APPLIED SCIENCES

Faculty of Engineering & Technology
Semester End Examination Question Paper – B. Tech.

Department: Computer Science and Engineering
Programme: B. Tech.
Semester/Batch: 3rd/2017
Date of Examination: 2nd January 2019
Course Code: CSC203A
Course Title: Logic Design

Semester End Examination-Theory

INSTRUCTIONS TO STUDENTS:

1. Answer any **FIVE** full questions
2. Use only SI units
3. Use of non-programmable scientific calculator is permitted
4. Use of data handbook permitted wherever applicable
5. Missing data may be appropriately assumed
6. Indicate the question number (including its part as applicable) for your answers

Maximum Duration: 3 Hours **Maximum Marks: 100**

You may take this question paper away at the end of the examination. Please keep it in a safe place for future reference

Question 1 ***(6 + 4 + 6 + 4 = 20 Marks)***

a. Convert $(523)_8$ to decimal, binary and hexadecimal representations.
b. List the possible 4-bit Gray Code representations in the correct order and mention its advantages.
c. Explain BCD addition using an example. Comment on the process to be followed if the result is not a valid BCD number.
d. "2's complement representation is more advantageous than 1's complement representation of a binary number". Discuss.

Question 2 ***(6 + 10 + 4 = 20 Marks)***

a. Illustrate the use of DeMorgan's laws to calculate the complement of:
   i. $F1 = x'yz' + x'y'z$
   ii. $F2 = [x(y'z' + yz)]$
b. Simplify $f(a,b,c,d) = \sum m(0,1,2,5,6,7,8,9,10,14)$ using the QM method and draw the circuit diagram for the simplified form.

c. Prove the Distributive law of Boolean algebra for three literals x, y and z using truth tables.

Question 3

(6 + 4 + 6 + 4 = 20 Marks)

a. Define different types of Prime Implicants in the context of K-Maps.

b. Simplify $f(a, b, c, d) = \sum m(0,1,2,3,6,10,11,14)$ using K-Maps. Draw a circuit for the simplified expression using only NAND gates.

c. Illustrate the implementation of basic gates (AND, OR and NOT) using:

   i. NAND gates

   ii. NOR gates

d. List different ways to simplify a Boolean Expression. If you had to write a program for this simplification, choose a method and justify.

Question 4

(6 + 5 + 5 + 4 = 20 Marks)

a. Differentiate between combinational and sequential circuits with suitable examples.

b. Implement the Boolean function $F(A, B, C, D) = \sum m(0,1,3,4,8,9,15)$ using a multiplexer.

c. Implement a three-output combinational circuit specified by the following Boolean functions using a decoder:

$$F1(A, B, C) = \sum m(2,4,7)$$
$$F2(A, B, C) = \sum m(0,3)$$
$$F3(A, B, C) = \sum m(0,2,3,4,7)$$

d. Develop a combinational circuit that can function both as a de-multiplexer and a decoder.

Question 5

(6 + 6 + 4 + 4 = 20 Marks)

a. Explain Ring Counters and Johnson Counters with block diagrams using JK Flip-flops.

b. Discuss the steps to convert SR Flip-flop into the following Flip-flops:

   i. D

   ii. JK

   iii. T

   Support your answer with appropriate block diagrams.

c. Differentiate between synchronous and asynchronous counters with examples.

d. Comment on the use of multiplexer in a Universal Shift Register.

Question 6

(6 + 10 + 4 = 20 Marks)

a. Differentiate between Programmable Logic Array (PLA) and Programmable Array Logic (PAL).

b. Simplify the following functions using K-Maps and draw the circuit using PAL:

$$W(A, B, C, D) = \sum m(2,12,13)$$
$$X(A, B, C, D) = \sum m(7,8,9,10,11,12,13,14,15)$$
$$Y(A, B, C, D) = \sum m(0,2,3,4,5,6,7,8,10,11,15)$$
$$Z(A, B, C, D) = \sum m(1,2,8,12,13)$$

c. Design a combinational circuit using only one 3:8 decoder that is able to generate the outputs of a full adder and full subtractor.

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