Code No: 53024 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, February/March - 2016

DIGITAL LOGIC DESIGN

(Computer Science and Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any five questions

All questions carry equal marks

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1.a) Explain BCD codes, Excess-3 code, Gray code, and ASCII codes used in digital systems.

b) Write about error detecting codes and error correcting codes used in digital systems.

c) Convert:

i) $68BE_{16}$ to Binary and then Octal

ii) Convert 345_{10} to binary and hexadecimal. [5+5+5]

2.a) Explain the axiomatic definition of Boolean algebra by taking two and three variables.

b) Express the Boolean function F= xy+ x'z in a product of maxterm form.

c) Explain the characteristics of the logic families:

i) TTL ii) ECL iii) MOS iv) CMOS. [5+5+5]

3.a) Simplify the following Boolean function in sum of products and product of sums:

$F(A, B, C, D) = \sum(0,1,2,5,8,9,10)$

b) Simplify the following Boolean functions, using a four variable Karnaugh map method and implement the simplified function using NAND gates.

$F(A,B,C,D) = \sum(0,2,4,5,6,7,8,10,13,15)$. [7+8]

4.a) Explain the design procedure for a combinational circuit for BCD to excess-3 code converter and draw the truth tables maps and logic diagram.

b) Draw the circuit diagram of 4 bit adder/subtractor and explain its working by taking suitable examples.

c) Explain the working of a 3 to 8 decoder with the help of neat diagram. [5+5+5]

5.a) Draw the logic diagram of sequence detector with D flip-flops and explain its operation with help of state table and state diagrams.

b) Design a logic diagram for a 3 bit binary counter using T flip-flops and write its state table and state diagram and write the HDL description of the circuit diagram. [7+8]

6.a) Draw the logic diagram of 4 bit UP/DOWN counter and write its HDL behavioral and structural descriptions.

b) Design a binary counter with the following repeated binary sequence: 0, 1, 2, 4, 6 using JK flip-flops. [7+8]

7.a) What are PLAs? Explain the functions and applications of PLAs in memory addressing and implement the following two Boolean functions with a PLA:
$F_1(A, B, C) = \sum (0, 1, 2, 4)$
$F_2(A, B, C) = \sum (0, 5, 6, 7)$

b) Explain the Procedure for error detection and correction using Hamming code and given an 8 bit data word 01011011 generate the 13 bit composite word that corrects single error and detects double errors. [7+8]

8.a) When did race condition occurs in asynchronous sequential circuits? Explain the noncritical and critical race conditions with typical examples.

b) Write about hazards in asynchronous logic circuits. Design a circuit that has no static hazards and implements the Boolean function
$F(A,B,C,D) = \sum(0,2,6,7,8,10,12)$. [7+8]

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