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B.Tech. III Semester (Main/Back) Examination Dec. - 2016

Applied Elect. & Inst. Engg

3AI4 Digital Electronics

EE, EX, EC, EI, CS, IT, AI

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 26

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit**. All questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Unit - I

1. a) For the integer with decimal representation 34567, give the corresponding bit vectors for BCD code and for excess - 3 code. **(8)**

   b) Design a network using only XOR gates which performs the following function.

$$Z = \begin{cases} x_i & if\ C = 0 \\ x_i & if\ C = 1 \end{cases}$$ **(8)**

OR

1. a) What do you mean by sequential code, self complementing code, cyclic code and excess - 3 code? Give one example of each code. **(8)**

   b) Using the postulates of Boolean algebra and the theorems, prove the following:

   i. $a'b' + ab + a'b = a' + b$

   ii. $ab' + b'c' + a'c' = ab' + a'c'$ **(8)**

Unit - II

2. a) Discuss CMOS NAND and NOR gates. **(8)**

   b) Explain the working of CMOS inverter. **(8)**

OR

2. a) Draw a neat circuit of TTL (Transistor Transistor Logic) NAND gate with totem pole output and explain. **(8)**

b) Draw a 3 input ECL (Emitter - Coupled Logic) OR/NOR gate and explain it's working? **(8)**

Unit - III

3. a) Simplify the following using the tabulation method :

$F = \sum(1,2,3,7,8,9,10,11,14,15)$ **(8)**

b) A stair case light is controlled by two switches one at the top of the stairs and another at the bottom of stairs. Realize the circuit when the lamp (L) glows. **(8)**

OR

3. a) Compare k-map technique and quine - Mc cluskey minimization technique. **(8)**

b) Simplify the expression $F(A,B,C,D) = ACD + \overline{A}B + \overline{D}$ **(8)**

Unit - IV

4. a) Implement the following function using 4×1 multiplexer.

$f(A,B,C) = \sum m(0,1,4,7)$ use A and C as select lines. **(8)**

b) What are the use of multiplexers and demultiplexers. Explain the construction and working of a multiplexer circuit. **(8)**

OR

4. a) Draw gate level schematic of a 1-to-4 decoder as component realize a 1-to-16 decoder. **(8)**

b) Signals A,B,C,D and A are available. Using only one 8 to 1 MUX and no other gate, implement the expression.

$F(A,B,C,D) = BC + AB\overline{D} + \overline{A}\,\overline{C}D$ **(8)**

Unit - V

5. a) Draw a logic diagram of clocked S-R flip - flop and obtain its characteristic equation. Also show its excitation table. **(8)**

b) Write short note on the following :

a. Asynchronous and synchronous counter.

b. Sequential and non sequential counter. **(4×2)**

OR

5. a) Construct 4-bit serial adder using shift registers and logic gates. Explain its operation. **(8)**

b) Determine the next state for each of six unused states in the BCD ripple counter. Is the counter self - starting? **(8)**