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Total number of printed pages – 2

B. Tech  
PCEC 4202

**Special Examination – 2012**  
**DIGITAL ELECTRONIC CIRCUIT**

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any **five** from the rest.  
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2 × 10
- (a) Add two numbers (–7, +18) in 2' complement notation.
- (b) What is a tri-state logic gate ? Explain its importance in logic circuits.
- (c) Write characteristics equation and excitation table for the T flip-flop.
- (d) What is lithographic process ?
- (e) What will happen when the time period of clock signal is greater than propagation time of the Flip-flop ? Explain with timing diagram.
- (f) Which is called a self complementing code and why ?
- (g) Draw the circuit diagram of a 4-bit even parity generator and checker.
- (h) How the 'fan in' and 'fan out' of TTL logic is specified ?
- (i) Design a MOD-2 counter with J-K flip-flop.
- (j) An equality detector gives the output  $Y = 1$ , if both the inputs of the combinational circuits are same and zero for other conditions.
2. (a) Simplify the following Boolean function using a four variable K-map :  
 $F(A, B, C, D) = \sum m(0, 1, 3, 4, 5, 7, 9, 11, 15)$ .  
And then, realize the simplified functions using logic gates. 5
- (b) Simplify the following function using Boolean algebra identity.  
 $F(A, B, C, D) = \sum m(4, 5, 6, 7, 12, 13, 14)$ .  
And then, write the simplified functions in POS and SOP form. 5

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3. (a) What is race around conditions ? How it is avoided
- (i) Using master slave Flip-flop ?
- (ii) Using edge triggering ? 6
- (b) Implement the following function using NOR gate only.
- $$\bar{F}(A, B, C, D) = (A + C)(B + D).$$
- Justify your answer with necessary mathematical expression. 4
4. (a) Design a combinational circuit which will convert a 4 bit binary number to 4 bit gray code. 5
- (b) Design a counter which will count the following repeated binary sequence : 0, 2, 5, 6, 7, 0, 2....., using T flip-flop. 5
5. (a) Design a sequential circuit with two D-flip-flops A and B and one input X. When X = 0, the state of the circuit remain same. When X = 1, the circuit goes through the state transition from 00 to 01 to 11 to 10 d back to 00 and repeats. 5
- (b) What is a shift register ? Explain the principle of a 4-bit Serial-in parallel-out shift register. 5
6. (a) Design a synchronous sequential circuit using D flip-flop which will count the binary sequence 1100. Also draw the state diagram and state table for the above circuits. 6
- (b) Implement the following Boolean function using  $4 \times 1$  MUX : 4
- $$F = A'B'C' + ABC + AB'C + A'BC'$$
7. (a) Explain the technique used for address multiplexing in D-RAM. 2
- (b) Explain how a J-K and S-R flip-flop can be constructed using D-flip-flop. 4
- (c) Explain briefly basic configuration of programmable logic devices (PLD). 4
8. Write short notes on any two : 5×2
- (a) Resistors
- (b) Programmable array logic
- (c) Binary parallel adder
- (d) Decade counter.

