

**II B. Tech I Semester Regular Examinations, October/November - 2017**

**DIGITAL LOGIC DESIGN**

(Com to CSE & IT)

Time: 3 hours

Max. Marks: 70

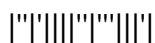
- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. Answer **ALL** the question in **Part-A**  
 3. Answer any **FOUR** Questions from **Part-B**
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**PART -A**

1. a) Find the 10's complement of 3826.
- b) Find the complement of the function:  $A'B(C+D)+B'C'+AB'C$ .
- c) Draw the 4-variable K-map.
- d) Write the truth table of a full subtractor.
- e) What is a state diagram?
- f) Write the differences between the Combinational and sequential circuits.

**PART -B**

2. a) Convert the following numbers to Octal:
  - (i)  $(1011.1010)_2$
  - (ii)  $(BABA)_{16}$
- b) Perform the binary subtraction using 1's and 2's complement methods.  
 $(110011)_2 - (1110011)_2$
3. a) Convert the given Boolean function into standard sum of minterms form.  
 $F = x'y + y'z + xz$
- b) Explain the theorems and properties of Boolean algebra.
4. Simplify the following Boolean function  
 $F(A, B, C, D) = \Sigma(0, 6, 8, 13, 14)$ ;  $d(A, B, C, D) = \Sigma(2, 4, 10)$   
 using K-Map method in (a) SOP form (b) POS form
5. a) Design a full subtractor circuit with basic gates.
- b) Write the HDL dataflow description of a 8X1 multiplexer.
6. a) Explain the operation of a JK flip-flop with the truth table.
- b) Draw the diagram of Mealy type state machine for serial adder and explain its operation.
7. a) Design a decade counter using T flip-flops.
- b) Explain the operation of a 4-bit shift register using RS flip-flops.



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**PART -A**

1. a) What are the universal gates? Why they are called as universal gates?
- b) What is Minterm and Maxterm
- c) Define the essential prime implicants in a K-map method.
- d) What is a multiplexer? Write its applications.
- e) What is a mealy machine
- f) Write the differences between the synchronous and asynchronous sequential circuits.

**PART -B**

2. a) Convert the following numbers to Binary:
  - (i)  $(59.425)_{10}$
  - (ii)  $(46BF)_{16}$
- b) Perform the subtraction in binary using 1's and 2's complement methods.  
 $(255)_{10} - (408)_{10}$
3. a) Convert the following Boolean function into standard product of maxterms form.  

$$F = A'B + C + B'D'$$
- b) State and prove the De Morgan's laws.
4. Simplify the following Boolean function  
 $F(A, B, C, D) = \Sigma(1, 3, 8, 10, 15)$ ;  $d(A, B, C, D) = \Sigma(0, 2, 9)$   
 using K-Map method in  
 (a) SOP form (b) POS form
5. a) Design an 8X1 multiplexer with basic gates.
- b) Write the gate level HDL description of the 4:16 decoder.
6. a) What is the drawback of JK flip-flop? How is it eliminated in Master Slave flip-flop? Explain with diagram
- b) What are the capabilities and limitations of finite state machines? Explain.
7. a) Design a modulo-10 ripple counter using RS flip-flops.
- b) Explain the operation of a 4-bit shift register using T flip-flops.



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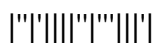
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PART -A

1. a) Find the 1's and 2's complement of the decimal number 101.
- b) What is a canonical form
- c) What do you mean by don't care combinations.
- d) What is a de-multiplexer? Write its applications.
- e) Write the features of Moore machine.
- f) What are the differences between Johnson and ripple counter.

PART -B

2. a) Convert the following number to Hexadecimal:
  - (i)  $(925.25)_8$
  - (ii)  $(1111010.10)_2$
- b) Perform the binary subtraction using 1's and 2's complement method.  
 $(1111101)_2 - (100111110)_2$
3. a) Write the theorems and postulates of Boolean algebra.
- b) Reduce the following Boolean function to four literals and draw the logic diagram:  $(A'+C)(A'+C')(A+B+C'D)$
4. Simplify the following Boolean function  
 $F(A, B, C, D) = \sum(2, 4, 6, 10, 12)$ ;  $d(A, B, C, D) = \sum(0, 8, 9, 13)$   
 using K-Map method in  
 (a) SOP form (b) POS form
5. a) Design a 4-bit binary adder-subtractor circuit with basic gates.
- b) Write an HDL dataflow description of a 4-bit adder-subtractor circuit of unsigned numbers.
6. a) Explain the operation of JK master-slave flip-flop.
- b) Obtain the state table and state diagram for a sequence detector to recognize the occurrence of sequence bits 110 & 001.
7. a) Design a Mod-10 counter using RS flip-flops
- b) Explain the operation of a 4-bit shift register using JK flip-flops.



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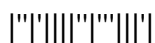
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**PART -A**

1. a) Convert the binary number 10111001 to gray code.
- b) Write the basic Boolean theorems.
- c) Draw the 5-variable K-Map.
- d) What is a decoder? Write its applications.
- e) What is a Flip flop
- f) What is a Ring counter.

**PART -B**

2. a) Express the following numbers in decimal:
  - (i)  $(126.25)_8$
  - (ii)  $(166.425)_{16}$
- b) Perform the subtraction in binary using 1's and 2's complement methods.  
 $(97)_{10} - (255)_{10}$
3. a) Find the dual and complement of the following function:  
 $A'BD' + B'(AC' + D') + A'BC'$
- b) Implement the following Boolean function with only two input NOR gates:  
 $F = (AB' + D')E + C(A' + B'D)$
4. a) Simplify the following Boolean function with the don't conditions  $d$  using K-map method:  
 $F(A, B, C, D) = \Sigma(4, 5, 7, 12, 13, 14)$ ;  $d(A, B, C, D) = \Sigma(1, 9, 11, 15)$
- b) Realize the simplified expression obtained in Q. 4(a) with only NAND gates.
5. a) Design a 4:16 decoder with basic gates.
- b) Write an HDL behavioral description of a 16X1 multiplexer.



6. a) Explain the D flip-flop with the help of truth table and excitation table.  
b) Convert the following Mealy machine into a corresponding Moore machine.

PS	NS, Z	
	X=0	X=1
A	C, 0	B, 0
B	A, 1	D, 0
C	B, 1	A, 1
D	D, 1	C, 0

7. a) Design a Mod-12 counter using D flip-flops.  
b) Explain the operation of a 4-bit shift register using D flip-flops.

