

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A**[25 Marks]**

- 1.a) Determine the possible base of the numbers in the operation $302/20=12.1$. [2]
- b) Reduce the expression $A'B(D'+C'D)+B(A+A'CD)$ to one literal. [3]
- c) What are static hazards? [2]
- d) Construct full adder using decoder. [3]
- e) What is the difference between characteristic table and excitation table? [2]
- f) Show the characteristic equation for the true output of JK flip-flop is $Q(t+1)=JQ'+K'Q$ [3]
- g) How many bit counter is needed to provide a clock with cycle time of 50ns if the clock generator produces pulses at a frequency of 80 MHz? [2]
- h) Compare Synchronous and Asynchronous counters. [3]
- i) What are compatible states? [2]
- j) Explain the difference between ASM and conventional flow chart with respect to timing. [3]

PART- B**[50 Marks]**

- 2.a) State De-Morgan laws. [2]
- b) Perform the following arithmetic operations in binary using signed 2's complement representation for negative numbers (i) $(+62) + (-23)$ (ii) $(-62) - (-23)$. [4]
- c) Encode the information character 01101110101 according to the 15 bit Hamming. [4]

[2+4+4]**OR**

- 3.a) Obtain the 1's and 2's complement of the binary numbers 10000000 and 0000001. [2]
- b) Show that a positive logic NAND gate is a negative logic NOR gate and vice versa. [2]
- c) Obtain the truth-table of the function $(xy+z)(y+xz)$ and express the function in sum of min terms and product of max terms. [4]

[2+4+4]

- 4.a) For the function $F(w,x,y,z)=\sum(1,2,3,5,13) + \sum\phi(6,7,8,9,11,15)$, find the minimal sum of products and product of sums expression. [5]
- b) Implement the function $F(A,B,C,D)=\sum(0,1,3,4,6,8,15)$ using 4x1 MUX. [5]

OR

- 5.a) Design a 3-input majority circuit using Multiplexer whose output is equal to 1 if the input variables have more 1's than 0's. The output is 0 otherwise. [5]
- b) Find the min terms of the function $wxy+x'z'+w'xz$ by plotting the function in a map. [5]

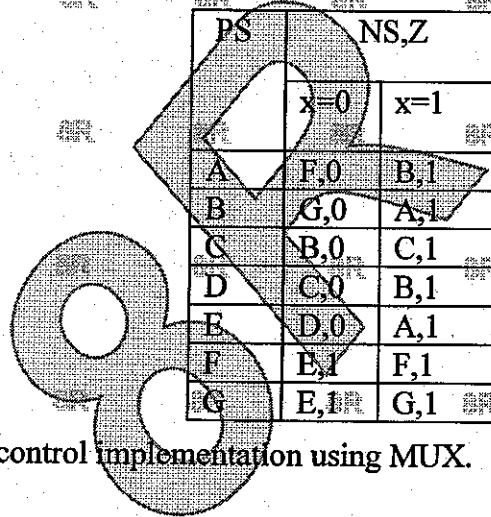
- 6.a) Compare Sequential and Combinational circuits. [5]
- b) Design a JK flip-flop using Dflipflop, 2-to-1 line MUX and inverter. [6]

OR

- 7.a) What is the difference between a latch and flip-flop?
 b) Explain the positive edge triggered D flip-flop with asynchronous reset. [4+6]
- 8.a) A sequential circuit with two D flip-flops A and B, two inputs x and y; and one output z is specified by $A(t+1)=xy+xA$, $B(t+1)=x'B+xA$, $z=B$. Draw the logic diagram and list the state table. Draw the state diagram.
 b) What is a universal shift register? [8+2]
- OR
- 9.a) Design a counter using T flip-flops with repeated sequence 0,1,3,7,6,4.
 b) Show that a Johnson counter with n flip-flops produces a sequence of 2^n states. [5+5]
- 10.a) Draw the multilevel NAND circuit for expression $F = (AB' + CD')E + BC(A \oplus B)$
 b) Reduce the given expression to a minimum number of literals:
 i) $\overline{(BC' + A'D)} \quad (AB' + CD')$
 ii) $AB' + CD\overline{(A + B)}$. [5+5]

OR

- 11.a) Find the equivalence partition and corresponding reduced machine in standard form.



- b) Explain the control implementation using MUX. [6+4]

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