B.Tech. Computer Science Engineering / Instrumentation Engineering / Electronics & Telecommunication Engineering (NEP) Semester-II

STESC203 - Digital Circuits

P. Pages : 2 **GUG/S/25/16797**

Time : Three Hours * 4 3 8 5 * Max. Marks : 80

Notes : 1. All questions carry marks as indicated.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) State and prove De-Morgan Theorem. **4**

b) Solve **4**
i) 10111.101 + 110111.01 = ? ii) $(0.3267)_{10} = (?)_{9\text{'s complement}}$

c) Subtract 1001.01 – 1111.11 using 2's complement method. **4**

d) Show that **4**
$AB'C + B + BD' + ABD' + A'C = B + C$

OR

2. a) Find the complement of **4**
i) $XY'Z' + X'Y'Z + XYZ'$ ii) $(A + B')(A + C')(A' + B)$

b) Simplify $Y = A + B[AC + (B + C')D]$ using Boolean algebra. **4**

c) Device a single error correcting code for 11 bit group 01101110101. Test the following Hamming Code Sequence for 11 bit message and correct it is necessary (101001011101011). **8**

3. a) Design 2-bit magnitude comparator. **8**

b) Minimize the function using McClusky F = S (1, 2, 5, 6, 7, 9, 10, 11, 14). **8**

OR

4. a) Design Moore Type Serial Adder. **8**

b) Simplify the logic function $F(A, B, C) = \sum m(0,1,3,5) + d(2,7)$ using K-map in SOP and POS form and implement using NAND and NOR gate respectively. **8**

5. a) What is Setup time and Hold time in Flip Flop. **4**

b) Convert D Flip Flop to JK Flip Flop. **6**

c) Define Encoder? Implement an Octal to binary encoder. **6**

OR

6. a) Implement Full Subtractor Using two 4:1 Multiplexer only. **8**

b) Design a 4 to 2 priority encoder with input D0, D1, D2, D3 such that D3 is having the highest priority followed by D2, D1 and D0. **8**

7. a) Construct 3-bit asynchronous binary down counter. **4**

b) Design a Moore type coin-operated vending machine that dispenses candy under the following conditions (i) The machine accepts one coin at a time either 2₹ Coin or 1₹ Coin (ii) It takes 3₹ for a piece of candy to be released from the machine. (iii) If 4₹ is deposited, the machine will not return the change, but it will credit the buyer with 1₹ and wait for the buyer to make a second purchase. **12**

OR

8. a) Discuss the relationship between state diagrams and ASM charts. **4**

b) Explain 4-bit SISO and PIPO shift register. **4**

c) Design MOD-6 counter using JK flip flop. Determine counter is self starting. **8**

9. a) Compare CPLD and FPGA. **4**

b) Draw CMOS inverter? Explain its operation in brief. **6**

c) Explain the operation of 2-Input TTL NAND gate. **6**

OR

10. a) Design a 2-bit comparator using PROM. **8**

b) Design a PAL of the following Boolean function **8**

i) $W(A, B, C, D) = \sum(2,12,13)$

ii) $X(A,B,C,D) = \sum(7,8,9,10,11,12,13,14,15)$

iii) $Y(A,B,C,D) = \sum(0,2,3,4,5,6,7,8,10,11,15)$

iv) $Z(A,B,C,D) = \sum(1,2,8,12,13)$

****