

(Set-1)

**B.Tech - 4th**  
**Digital Electronics Circuits**

Full Marks : 70

Time : 3 hours

**Q. No. 1** is compulsory and answer any  
**five** from the rest

*The figures in the right-hand margin indicate marks*

1. Answer the following questions : 2 × 10

- (a) What is the utility of Gray code ?
- (b) Realise a JK FF to a T FF ?
- (c) Determine the values of  $A$ ,  $B$ ,  $C$  and  $D$  that make the sum term  $\bar{A} + B + \bar{C} + D$  equal to zero.
- (d) Which type of gate can be used to add two bits ?
- (e) The bit sequence 0010 is serially entered

( Turn Over )



(right-most bit first) into a 4-bit parallel out shift register that is initially clear. What are the  $Q$  outputs after two clock pulses ?

- (f) When used with an IC, what does the term "QUAD" indicates ?
  - (g) Convert the fractional binary number 0000.1010 to decimal.
  - (h) How many flip-flops are required to make a MOD-32 binary counter ?
  - (i) A type of digital circuit technology that uses bipolar junction transistors is \_\_\_\_\_
  - (j) Why does the TTL family use a totem-pole circuit on the output ?
2. Obtain the simplified expressions for the following equations : 10

(a)  $F(x, y, z) = \sum(0, 1, 4, 5)$

(b)  $F(A, B, C, D) = \pi(0, 1, 2, 3, 4, 10, 11)$

(c)  $F(w, x, y, z) = \sum(1, 3, 5, 7, 13, 15)$

3. (a) Implement the following function with MUX.

$$F(A, B, C, D) = \sum(0, 1, 3, 4, 8, 9, 15) \quad 5$$

- (b) Given a Boolean equation

$$Y = A'BC'D + A'BCD' + AB'CD'$$

show the simplified NAND-NAND circuit for the above equation. 5

4. (a) Draw a circuit for BCD to excess 3 code converter. 5

- (b) Draw a suitable TTL LED driver. 5

5. (a) Implement a full adder circuit with multiplexers. 5

- (b) A combinational circuit is defined by the following three functions :

$$F_1 = x'y' + xyz', \quad F_2 = x' + y', \quad F_3 = xy + x'y'$$

Design the circuit with a decoder and external gates. 5



6. (a) What is a master slave flip flop ? Draw and explain the logic diagram of master slave D flip flop. Use NAND gates only. 5
- (b) Draw the diagram of a positive edge triggered 4-bit binary ripple up counter using flip flops. Explain its operation using timing diagram. 5
7. (a) Design a state diagram for a 3-bit binary up counter and derive its state table and draw its logic circuit diagram. 5
- (b) The content of a 4-bit shift register is 1100. If the content of a 4 bit shift register is 1100. If the register is shifted 8 times to the right with a serial input 11010010. Explain its operation by showing the content of the register after each shift. 5
8. Write short notes on the following (any three) : 10
- (i) Decade Counter
  - (ii) Combinational circuits
  - (iii) Master Slave Flip Flop
  - (iv) Full adder using Half adder
  - (v) CMOS Logic Circuits.
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