

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BE
BRANCH: ECE/EEE/CSE/IT

SEMESTER : III/ADD
SESSION : MO/16

SUBJECT: EC3201-DIGITAL ELECTRONICS

TIME: 1.5 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The total value of the questions are 30 marks.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtain exceed 25 marks. The excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

- Q1. (a) Simplify the following function using the don't care conditions in SOP form using K-map? [3]

$$F(A, B, C, D) = \sum(0, 6, 8, 13, 14)$$

$$d(A, B, C, D) = \sum(2, 4, 10)$$

- (b) Convert the following numbers to signed 10's complement form and find the following sums: [2]

(i) $(+9742) + (-641)$

(ii) $(-9742) + (-641)$

- Q2. (a) Simplify the following Boolean function in SOP form by means of the Quine-McCluskey method. [3]

$$F(A, B, C, D, E) = \sum(0, 1, 2, 8, 9, 15, 17, 21, 24, 25, 27, 31)$$

- (b) Implement the following function with NAND gate. Use only 4 gates. Only the normal inputs are available. [2]

$$F(w, x, y, z) = w'xz + w'yz + x'yz' + wxy'z$$

$$d(w, x, y, z) = wyz$$

- Q3. (a) Design a full adder circuit using two half adders? [3]

- (b) Implement the following Boolean function using 8 X 1 multiplexer, the selection lines of the multiplexer should be connected to inputs A, B and C? [2]

$$F(A, B, C, D) = \prod(2, 5, 6, 7, 10, 11, 12, 13, 14)$$

- Q4. (a) A combinational circuit is defined by the following three functions: [2]

$$F1 = x'y' + xyz'$$

$$F2 = x' + y$$

$$F3 = xy + x'y'$$

Design the circuit with a decoder and external gates

- (b) A majority circuit is a combinational circuit whose output is equal to 1 if the input variables have more 1's than 0's. The output is 0 otherwise. Design a 3 input majority circuit by finding the circuit's truth table, Boolean equation and logic diagram. [3]

- Q5. (a) Design J-K flip-flop. What is race-around condition in it? [3]

- (b) Design a synchronous MOD-8 up counter? [2]

- Q6. Write short notes on:

(i) Master Slave Flip Flop. [3]

(ii) 4-bit right shift register [2]

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