MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-EE 402/PC-EEE 402 Digital Electronic

UPID : 004419

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]

(I) What is the difference between digital signal and discrete signal?

(II) In a DRAM, what is the state of R/W during a read operation?

(III) A binary-weighted digital-to-analog converter has an input resistor of 100 k Ω. If the resistor is connected to a 5 V source, the current through the resistor is:

(IV) What is the meaning of RAM, and what is its primary role?

(V) How is an encoder different from a decoder?

(VI) How you can convert a two-input NAND gate to an inverter?

(VII) The difference between analog voltage represented by two adjacent digital codes, or the analog step size, is known as _____.

(VIII) A 64-bit word consists of _____.

(IX) Convert the following SOP expression to an equivalent POS expression.
$A\,B\,C + A\,\overline{B}\,\overline{C} + A\,\overline{B}\,C + A\,B\,\overline{C} + \overline{A}\,\overline{B}\,C$

(X) If two inputs are active on a priority encoder, which will be coded on the output?

(XI) From the truth table below, determine the standard SOP expression.

Inputs			Output
A	B	C	X
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	0

(XII) What is difference between Frequency Division multiplexing and Wave Division multiplexing?

Group-B (Short Answer Type Question)

Answer any three of the following : [5 x 3 = 15]

2. What is a multiplexer circuit? Briefly describe one or two applications of a multiplexer? [5]

3. What is meant by the race around problem in J-K flip-flops? How does a master–slave configuration help in solving this problem? [5]

4. Design the circuit by following proper steps for the Boolean expressions of the two output variables given in the equations below. [5]

$$D = \overline{A}.\overline{B}.B_{in} + \overline{A}.B.\overline{B}_{in} + A.\overline{B}.\overline{B}_{in} + A.B.B_{in}$$

$$B_o = \overline{A}.\overline{B}.B_{in} + \overline{A}.B.\overline{B}_{in} + \overline{A}.B.B_{in} + A.B.B_{in}$$

5. What is a flip-flop? Show the logic implementation of an R-S flip-flop having active HIGH R and S inputs. Draw its truth table and mark the invalid entry. [5]

6. Starting with the Boolean expression for a two-input OR gate, apply Boolean laws and theorems to modify it in such a way as to facilitate the implementation of a two-input OR gate by using two-input NAND gates only. [5]

Group-C (Long Answer Type Question)

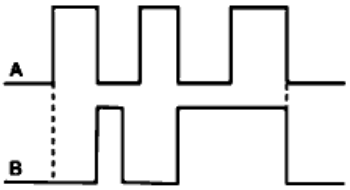
Answer any three of the following : [15 x 3 = 45]

7. What is meant by the radix or base of a number system? Briefly describe why hex representation is used for the addresses and the contents of the memory locations in the main memory of a computer. Assume a radix-32 arbitrary number system with 0–9 and A–V as its basic digits. Express the mixed binary number (110101.001)2 in this arbitrary number system. [5+10]

8. (a) How do you characterize or define a combinational circuit? How does it differ from a sequential circuit? Give two examples each of combinational and sequential logic devices. [7]

   (b) For the half-adder circuit of following figure, the inputs applied at A and B are as shown in graphical form. [8]
   Plot the corresponding SUM and CARRY outputs on the same scale.

(a)



(b)

9. (a) How do you distinguish between positive and negative logic systems? Prove that an OR gate in a positive logic system is an AND gate in a negative logic system. [7]

   (b) Why are NAND and NOR gates called universal gates? Justify your answer with the help of examples. [4]

   (c) What are logic gates with open collector or open drain outputs? What are the major advantages of such devices? https://www.makaut.com [4]

10. (a) Implement the product-of-sums Boolean function expressed by $\Sigma(0,3,4,6,7)$ by a suitable multiplexer. [8]

    (b) What is a demultiplexer and how does it differ from a decoder? Can a decoder be used as a demultiplexer? If yes, from where do we get the required input line? [7]

11. (a) A certain eight-bit D/A converter has a full-scale output of 5 mA and a full-scale error of ±0.25 % of full scale. Determine the range of expected analogue output for a digital input of 10000010. [8]

    (b) The data sheet of a certain eight-bit A/D converter lists the following specifications: resolution eight bits; full-scale error 0.02 % of full scale; full-scale analogue input +5 V. Determine (a) the quantization
    error (in volts) and (b) the total possible error (in volts). [7]

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