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# [ 21 HRKP1S(N)-22A ]

## DCA/PGDCA/MScIT 1st Semester (New) Exam., 2021 (W)

## DIGITAL TECHNIQUES

[ PGCA/ScIT S1 02 ]

*Full Marks* : 70/80

*Time* : 3 hours

*The figures in the margin indicate full marks for the questions*

**Note :** *(a)* Learners admitted in 2020 and 2021 are to answer 70 Marks (Question Nos. **1** to **4**).

*(b)* Learners admitted in and before 2019 are to answer all the questions (Question Nos. **1** to **5**), i.e., for 80 Marks.

**1.** Answer any *five* of the following questions : 2×5=10

*(a)* Represent $(1010.1010)_2$ with floating point representation.

*(b)* Find the addition of 29 and –15 in binary using 7-bit register in 2's complement method.

*(c)* Give the truth table for half subtractor.

*(d)* Write the function of register. What are the types of registers based on shifting of binary number?

*(e)* Mention three characteristics of SRAM.

*(f)* How can you convert a function from one canonical form to other?

**2.** Answer any *four* from the following questions : 3×4=12

*(a)* Obtain the simplified expression in product of sum (POS) :

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

*(b)* Define flip-flop. Draw an *R-S* flip-flop using NOR gates.

(c) Explain a 4-bit parallel adder with suitable diagram.

(d) Mention two types of complement-representation of a number of base *r*. Describe them in brief.

(e) Convert the following :

(i) $(110010.101)_2$ into decimal number

(ii) $(A3C.BB)_{16}$ into binary equivalent

**3.** Answer any *four* from the following questions : 6×4=24

(a) Write the importance of Gray codes. Covert the binary numbers 10011 and 10111 into Gray codes.

(b) Obtain the logic function and logic circuit from the following truth table :

| *X* | *Y* | *Z* | *F* |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |

(c) Why are NAND and NOR called universal gates? Draw the logic diagram of AND gate and OR gate by using NAND gate.

(d) What is the main problem in *R-S* flip-flop? Discuss *J-K* flip-flop with logic diagram and show how the problem of *R-S* flip-flop is resolved.

(e) Define decoder. Draw a 3-to-8 decoder circuit and find the truth table for the same.

**4.** Answer any *three* from the following questions : 8×3=24

(a) Mention the applications of ROM. Explain ROM classification.

(b) What do you mean by modulus of a counter? Discuss ripple counter with a suitable diagram.

(c) Define the purpose of shift registers. Explain the working principle of Serial in-Serial out shift register with the block diagram.

(d) Mention the use of BCD code in computing system. Find the addition of following BCD numbers :

(i) 1001 + 0101

(ii) 1000011 + 1101011

**The following question is *NOT* for the learners admitted in 2020 and 2021 batches :**

5. Answer any *one* from the following questions : 10

(a) Give the differences between asynchronous and synchronous counter. Draw a MOD-8 counter and explain its working principles.

(b) Convert the decimal number $(1460.125)_{10}$ to a 64-bit double precision floating point binary number.

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