TDC (CBCS) Odd Semester Exam., 2022

PHYSICS

(Honours)

(3rd Semester)

Course No. : PHSHCC-303T

(Digital Systems and Applications)

Full Marks : 50
Pass Marks : 20

Time : 3 hours

The figures in the margin indicate full marks for the questions

UNIT—I

1. Answer any *two* of the following : 2×2=4

(a) How is phase difference measured using CRO? Explain.

(b) Explain active and passive components giving examples of each of them.

(c) Convert 13·24 into its binary equivalent.

2. Answer any *one* of the following : 6

(a) With the help of a structured block diagram, explain the working of its various units of a CRO. 2+4=6

(b) Realize the circuit diagram of a two-input AND gate using discrete components and explain its working using its truth table.

UNIT—II

3. Answer any *two* of the following : 2×2=4

(a) State and verify De Morgan's theorems.

(b) What do you mean by minterms and maxterms?

(c) Using Boolean algebra, simplify the following expression :

$$Y = (A \cdot B) \cdot (A + C)$$

4. Answer any *one* of the following : 6

(a) With the help of an example, explain the sum of products method to convert a truth table to an equivalent Boolean expression. Draw the corresponding logic circuit. 4+2=6

(b) What is the use of a multiplexer in digital communications? Using a block diagram, explain the working of a 4-to-1 multiplexer. 2+4=6

UNIT—III

5. Answer any *two* of the following : 2×2=4

(a) Subtract 10100 from 11011 by 2's complement method.

(b) What is a half-adder? With the help of its truth table, draw its logic circuit.

(c) Explain the purposes of preset and clear functions in flip-flops.

6. Answer any *one* of the following : 6

(a) Draw the block diagram of a *J-K* flip-flop and describe its working. What are race-around conditions in *J-K* flip-flop? 4+2=6

(b) What is a subtractor? Explain the working of a full subtractor in detail with necessary truth table and logic diagram. 1+5=6

UNIT—IV

7. Answer any *two* of the following : 2×2=4

(a) Explain a 4-bit serial-in parallel-out shift register.

(b) Write a brief note on decade counters.

(c) Briefly explain the terms 'RAM' and 'ROM'.

8. Answer any *one* of the following : 6

(a) Write notes on the following : 3×2=6

(i) Asynchronous counter

(ii) Ring counter

(b) Draw the internal organization of a digital computer and explain briefly the functions of its various units.

UNIT—V

9. Answer any *two* of the following : 2×2=4

(a) Draw the block diagram of an IC555 showing simplified view of internal structures.

(b) Draw the internal organizations of an 8085 microprocessor.

(c) Describe the functions of ALU used in microprocessors.

10. Answer any *one* of the following : 6

(a) *(i)* What do you mean by 'bus' in digital microprocessors?

(ii) Describe the timing and control circuitry in microprocessors. 2+4=6

(b) With a proper circuit diagram, explain the working of an astable multivibrator using IC555. Obtain the formula for frequency of its oscillation. 4+2=6

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