3 SEM TDC PHYH (CBCS) C 7

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(Held in April–May, 2021)

PHYSICS

(Core)

Paper : C–7

(Digital Systems and Applications)

Full Marks : 53
Pass Marks : 21

Time : 3 hours

The figures in the margin indicate full marks
for the questions

1. Choose the correct answer from the following : 1×5=5

(a) The signal to be observed on the screen of an oscilloscope is applied

(i) across its *X*-plates

(ii) across its *Y*-plates

(iii) to the horizontal amplifier

(iv) to the trigger circuit

(b) After counting 0, 1, 10, 11, the next binary number is

(i) 12

(ii) 100

(iii) 101

(iv) 110

(c) An X-OR gate produces an output only when its two inputs are

(i) high

(ii) low

(iii) different

(iv) same

(d) The expression $\overline{ABC}$ can be simplified to

(i) $\overline{A} \cdot \overline{B} \cdot \overline{C}$

(ii) $AB + BC + CA$

(iii) $AB + \overline{C}$

(iv) $\overline{A} + \overline{B} + \overline{C}$

(e) If an inverter is placed at the input to an *S-R* flip-flop, the result is

(i) *D* flip-flop

(ii) *J-K* flip-flop

(iii) *T* flip-flop

(iv) *BCD* decade counter

(**3**)

2. Define deflection sensitivity of a CRT. Obtain an expression for the deflection sensitivity of the electrostatic type.   1+3=4

3. What is monolithic IC? Explain the steps involved in fabricating a diode in an IC.   3

4. *(a)* Convert the binary number 100111010·101010 into octal number.   2

    (b) Describe how NOR gate can be constructed using diodes and transistors. Explain their action with their truth table.   3

5. *(a)* State and prove De Morgan's two theorems.   3

    (b) Show that $AB + A\overline{B}C + B\overline{C} = AC + B\overline{C}$ using Boolean algebra.   3

Or

Simplify the expression

$$Y = ABCD + ABC\overline{D} + A\overline{B}CD + A\overline{B}C\overline{D}$$

using Karnaugh map and draw the logic circuit for the reduced expression.

6. Draw the logic diagram of multiplexer and explain it.   3

7. *(a)* State the rules for binary subtraction. Explain 1's complement and 2's complement method with examples.   3

(**4**)

Or

Draw the logic circuit diagram of a full subtractor. Find out its outputs and draw the truth table.

    (b) Draw the logic diagram of a half-adder and write its truth table.   2

8. What is flip-flop? Draw the logic diagram of *J-K* flip-flop and explain it.   1+3=4

9. *(a)* Draw and explain the functional diagram of IC-555.   3

Or

With a circuit diagram, explain the operation of astable multivibrator using IC-555.

    (b) Draw the logic diagram of 4-bit serial-in, serial-out shift register.   2

10. Write a short note on asynchronous counter.   4

11. *(a)* Write a short note on Random Access Memory (RAM).   2

    (b) Explain the function of ALU in microprocessor.   3

12. What is stack? What is the function of stack pointer? Discuss PUSH and POP operation.   4

Or

Draw and explain the timing diagram for the instruction MVIr data.

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