FYUG Odd Semester Exam., 2023
(Held in 2024)

COMPUTER SCIENCE

(1st Semester)

Course No. : CSCDSC-101T

(Digital Computer Fundamentals)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

SECTION—A

Answer *ten* questions, selecting any *two* from each Unit : 2×10=20

UNIT—I

1. What is arithmetic logic unit?

2. What is Random Access Memory (RAM)?

3. Write down the differences between hardware and software.

UNIT—II

4. State the laws of De Morgan.

5. Find the one's complement and two's complement of $(57)_{10}$.

6. Explain the canonical and standard forms of Boolean algebra.

UNIT—III

7. Which gates are called universal gates and why?

8. Write down the differences between RAM and ROM.

9. Draw the circuit diagram of a half-adder.

UNIT—IV

10. What is sequential circuit?

11. What is flip-flop?

12. Define counter.

UNIT—V

13. What is register?

14. What is binary counter?

15. Write two properties of random access memory.

SECTION—B

Answer *five* questions, selecting *one* from each Unit : 10×5=50

UNIT—I

16. Discuss about the evolution of computer.

17. Draw the block diagram of a basic computer. Explain its various components.

UNIT—II

18. *(a)* Given the Boolean function

$$F = xy'z + x'y'z + xyz$$

(i) Draw the logic diagram using the Boolean expression. 3

(ii) Simplify the algebraic expression using Boolean algebra. 3

(b) Simplify the following Boolean function using four-variable map : 4

$F(A, B, C, D) = \Sigma(0, 1, 3, 4, 6, 7, 9, 10, 13, 15)$

19. (a) Find the prime implicants and a minimal sum of products form for the following expression : 5

$$E = xyz + xyz' + xy'z + x'yz + x'y'z$$

(b) Express the Boolean expressions

$$E_1(x, y, z) = y(x + yz)'$$

and $E_2(x, y, z) = z(x' + y) + y'$

as a sum of products. 5

UNIT—III

20. What is multiplexer? Draw the circuit diagram of an 8×1 multiplexer and explain its operation. 2+8=10

21. (a) What is decoder? Design a 2-to-4 line decoder with enable input. 2+4=6

(b) Design a full-adder with half-adder and OR gate. 4

UNIT—IV

22. (a) What is the difference between a latch and a flip-flop? 2

(b) Draw and explain the operations of a master-slave *J-K* flip-flop. 8

23. Write short notes on the following : 5+5=10

(a) *R-S* flip-flop

(b) *J-K* flip-flop

UNIT—V

24. (a) Draw and explain the operations of a synchronous counter. 7

(b) Write a short note on shift register. 3

25. (a) Explain the working principle of binary ripple counter. 7

(b) Write a short note on random access memory. 3

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