TDC (CBCS) Even Semester Exam., 2023

COMPUTER APPLICATIONS

(2nd Semester)

Course No. : CACCC–202T

(Computer System Architecture)

Full Marks : 70
Pass Marks : 28
Time : 3 hours

The figures in the margin indicate full marks for the questions

SECTION—A

Answer any *ten* questions : 2×10=20

1. List the truth table of a three-variable exclusive–OR (odd) function :

$$x = A \oplus B \oplus C$$

2. Draw the logic diagram of a 3-to-8 line decoder.

3. Simplify the following Boolean function using three-variable map :

$$F(x, y, z) = \sum(1, 2, 3, 6, 7)$$

4. What is binary counter? Give example.

5. Prove that the sum of all minterms of a Boolean function of n variable is 1.

6. Perform the following subtraction with 2's complement :

11010 – 10000

7. Convert binary 11010111·110 to hexadecimal.

8. Explain the following memory operation :

$R_2 \leftarrow M[AR]$, $M[AR] \leftarrow R_3$

9. Draw 4-bit binary adder.

10. Define register reference instruction and input-output instruction.

11. What is interrupt?

12. What is cycle stealing?

13. What is input-output processor?

14. What is virtual memory?

15. Define start bit and stop bit.

SECTION—B

Answer any *five* questions : 10×5=50

16. *(a)* A majority gate is a digital circuit whose output is equal to 1 if the majority of the inputs is 1's. The output is 0 otherwise. By means of a truth table, find the Boolean function implemented by a 3-input majority gate. Simplify the function. 5

(b) Show that the dual of the exclusive–OR is equal to its complement. 3

(c) Given below the Boolean function :

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

Implement it with only AND and NOT gates. 2

17. What is flip-flop? Explain different types of flip-flops with logic diagram, characteristic table, characteristic equation and graphic symbol. 2+8=10

18. Explain addition and subtraction with signed magnitude data. Also, show hardware for signed magnitude addition and subtraction. 5+5=10

19. *(a)* Convert the following decimal numbers to the bases indicated : 1+1+1=3

(i) 7562 to octal

(ii) 1938 to hexadecimal

(iii) 175 to binary

(b) Define 2's complement and 9's complement with examples. 4

(c) Explain how floating point numbers are represented in computer system. 3

20. *(a)* What is a program interrupt? Explain the process of interrupt cycle. 2+3=5

(b) Draw a neat diagram of control unit. Consider a 4-bit sequence counter and explain it by showing the timing signal with CP. 5

21. Briefly describe the functions of a basic computer resister.

22. Explain different addressing modes with example.

23. Explain the concept of stack organization. Write the procedures for converting infix notation to RPN. Also convert the following arithmetic expression (infix) to the post-fix notation (RPN) and the stack operation and also the computer stack related to the expression :

$$A / B ** C + D * E - A * C$$

Where $A = 10, B = 4, C = 2, D = 8, E = 6$.

24. Explain the difference between isolated I/O and memory-mapped I/O. What are the advantages and disadvantages of each?

25. With the help of a flowchart, explain how data from an input device can be written into memory under the supervision of CPU. Draw a block diagram of data transfer from I/O device to CPU through an interface.

★ ★ ★