2019

COMPUTER SCIENCE

[Honours]

PAPER – II

Full Marks : 90

Time : 4 hours

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

GROUP – A

Answer any **two** questions : 15×2

1. (a) Draw and describe Master-Slave JK flip-flop using NAND Gate.   6

(b) Prove that : 4

$$(A + B)(\bar{A}\bar{C} + C)(\overline{\bar{B} + AC}) = \bar{A}B.$$

(c) What is meant by edge triggering ? Give the difference between positive edge triggering and negative edge triggering. 2 + 3

2. (a) Prove that : 5

$$\neg (P \wedge Q) \rightarrow (\neg P \vee (\neg P \vee Q)) \leftrightarrow (\neg P \vee Q)$$

(b) Solve the recurrence relation

$$a_n = \sqrt{a_{n-1} + \sqrt{a_{n-2} + \sqrt{a_{n-3} + \sqrt{......}}}}$$

with $a_0 = 4$. 5

(c) Prove that
$n (n + 1) (n + 2)$ is multiple of 6. 5

3. (a) What is IP Address ? Discuss about the structure of class C IP address format. 5

(b) With a neat diagram draw and explain the basic structure of n-channel JFET. 5

(c) Draw and describe the four bit comparator circuit. 5

4. (a) What is reference model ? Compare TCP and OSI models with suitable diagram. 8

(b) What is Fermi level ? Draw the fermi energy band-diagram for conductors, semi-conductors and metals. 7

GROUP – B

Answer any **five** questions : 8 × 5

5. Explain guided and unguided media. What is multiplexing ? 6 + 2

6. Explain the operation of a bi-directional shift register. 8

7. Use Boolean algebra to simplify the following Boolean expression and implement in NAND logic.

$$f(A, B, C, D) = \Sigma m (10, 11, 14, 15)$$ 8

8. (a) Design of MOD-10 counter. 6

   (b) What do you mean by positive logic and negative logic. 2

9. Write down the different characteristics of Zener diode. Describe the phenomenon of Zener breakdown. 6 + 2

10. Design an 16 : 1 MUX using 4 : 1 MUX and necessary gates ? 8

11. Assume Message M = 1010101010 bits and generator G = 10001 bits. Explain, how CRC is used for error detection using above message bits and generator bits. 8

12. Write the advantages and disadvantages of the following : 2 × 4
    (a) Hub
    (b) Bridge
    (c) Modem
    (d) Switch.

GROUP — C

Answer any **five** questions :   4 × 5

13. What is network topology ? Briefly explain it.   4

14. Write a short note on seven segment display.   4

15. Explain the working principle of 1 : 16 demultiplexer.   4

16. Draw a 4-bit parallel subtractor using full adder.   4

17. Draw HDLC frame structure.   4

18. Write down the characteristics of tri-state buffer.   4

19. What is congestion ? How does it occurs ?   4

20. Describe Nyquist Bit Rate and Shannon capacity of a channel.   2 + 2

[*Internal Assessment* : 10 Marks]