2015

COMPUTER SCIENCE

[Honours]

PAPER – II (New)

Full Marks : 100

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

[NEW SYLLABUS]

GROUP – A

Answer any **two** questions : 15 × 2

1. (*a*) Design a synchronous counter for count the sequence 4, 6, 7, 3, 1, 4 .... avoid lockout condition use JK flip-flop. 8

(*b*) Design a full substractor using demultiplexer. 7

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

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

with $a_0 = 4$. 5

(*c*) Prove that

$n(n + 1)\ (n + z)$ is a multiple of 6. 5

3. (*a*) Draw and explain the input and output characteristic of a BJT in common-emitter configuration and label the regions of operation clearly. 10

(*b*) What is Fermi level ? Draw the fermi energy band-diagram for conductors, semi conductors and metals. 5

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

(*b*) What is protocol ? Explain IP addressing in details. 7

GROUP – B

Answer any **five** questions : 8 × 5

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

6. (*a*) Define α and β for transmitor and also derive the relation between them. 5

(*b*) What is Avalanche diode ? 3

7. How does JK FF differ from an SR FF in its basic operation ? With neat diagram explain the working of a master stave JK FF. 8

8. What is PROM ? Describe various methods which can be used to erase a PROM. Can a PROM be used to inplement a truth table ? Justify your answer. 8

9. Consider the set $A = (2, 7, 14, 28, 56, 84)$ and the relation $a \leq b$ if and only if a divides b. Give the Hasse diagram for the poset $(A, \leq)$. 8

10. With neat diagram briefly explain the working of a bridge-rectifier. 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 one disadvantage of the following : 2×4

(*a*) Hub

(*b*) Bridge

(*c*) Modem

(*d*) Switch.

GROUP – C

Answer any **five** questions : 4×5

13. What are the disadvantage of serial adder ? For which application are they preferred ? 4

14. State and prove De Morgan's theorem. 4

15. A diode whose internal resistance is 20 Ω is to supply power to a 1 KΩ load from a 110 V (rms) source of supply. Calculate : 2 + 2

(*i*) Peak load current

(*ii*) DC load current.

16. Minimize the following expression : 4

$$F(A, B, C, D) = \Pi(0, 1, 4, 5, 8, 12, 13, 14, 15)$$

17. What is bistable multivibrator ? Draw the block diagram only. 4

18. What do you mean by positive and negative feedback in amplifiers. 4

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

[*Internal Assessment* : 10 Marks]