OLD

2017

Part II 3-Tier

ELECTRONICS

PAPER—II

(General)

Full Marks : 100

Time : 3 Hours

The figures in the right-hand margin indicate full marks.

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

Group—A

Answer any *two* questions. 2×15

1. (a) Convert the following to decimal numbers :

(i) $(30.1)_5$

(ii) $(100011.0101)_2$

(b) (i) State de Morgan's theorem and write the mathematical representation.

(ii) Write the truth-table for an 2-input EX-OR gate.

(c) Simplify the following :

(i) $f = A + B\left[AC + \left(B + \overline{\overline{C}}\right)D\right]$

(ii) $f = A\left[B + \overline{C}\left(\overline{AB + A\overline{C}}\right)\right]$ (2+2)+(2+2)+($3\frac{1}{2}\times2$)

2. (a) Design an X-NOR gate using NOR gates.

(b) Implement the following equation by circuits (minimal form) :

$$y = A\overline{BCD} + AB\overline{C}D + ABCD + AB\overline{CD}$$

(c) What are the differences between combinational circuit & sequential circuit ?

(d) Design a CMOS logic NOR gate & hence explain its operation. 3+5+2+5

3. (a) Write down the truth table of SR flip-flop, its characteristic equation and then draw the circuit.

(b) What is race around condition ? How it can be avoided.

(c) What is the difference between ROM & RAM ? Show the design of a 4-bit RAM ? (3+2+3)+2+(2+3)

Group—B

Answer any *five* questions. 5×8

4. Give the schematic diagram of a regulated power supply using op-amp. Explain its operation. 3+5

5. Give the structure and design method of a multirage DC voltmeter with 0–10 volt, 0–50 volt and 0–250 volt range.

(Internal resistance of basic meter is 100Ω and full scale current is 1 mA). 4+4

6. (a) Explain with circuit diagram the operation of an AC voltmeter using rectifier.

(b) How the R.M.S. voltage can be measured directly using a voltmeter ? 5+3

7. Write down the principle of operation of a single phase watt-hour meter with a diagram. 5+3

8. Draw the block diagram of a function generator & explain its operation. 3+5

9. Explain with neat sketch the principle of operation of cathode ray oscilloscope. 3+5

10. Draw graphical representation of a saw-tooth wave. How this type of voltage wave is employed in CRO ? Explain. 2+6

Group—C

Answer any *five* questions. 5×4

11. (a) Draw the circuit diagram of a Master-Slave flip-flop and explain its principle of operation.

(b) Write short note on a Q-meter. 5+3

12. Show the addition and subtraction result of the following two numbers :

$(10110100)_2$ and $(01110010)_2$ 2+2

13. Compare the properties of TTL & CMOS logic families. 4

14. Give the design of an opto-electronics 'XOR' gate and explain its operation. 2+2

15. What is the difference between dual beam and dual trace CRO ? 4

16. Explain Lissajious pattern of CRO. 4

17. What is the difference between edge triggered flip-flop and level triggeted flip-flop ? 4

18. What is the application of MUX & flip-flop ? 4

19. What factors should be considered in choosing analog voltmeter for reporting experimental data ? 4

Internal Assessment : *10*