

**2015**  
**NEW**  
**Part II 3-Tier**  
**ELECTRONICS**  
**PAPER—II**  
**(General)**

*Full Marks : 90*

*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.*

*Illustrate the answers wherever necessary.*

**Group—A**

Answer any *two* questions.

15×2

1. (a) Implement X-OR gate using :
  - (i) NAND ; (ii) NOR gate.
  - (b) Describe the operating principle of a CMOS 'NOR' gate.
  - (c) Minimize the following functions using Karnaugh Map methods :
    - (i)  $f_1 = \sum m (0, 2, 4, 6, 7, 8, 10, 12, 13, 15)$
    - (ii)  $f_2 = \prod M (5, 6, 7, 9, 10, 11, 13, 14, 15)$

(2+2)+3+(4+4)

*(Turn Over)*

2. (a) Design an even parity Bit generator for 4-bit inputs.  
 (b) Use a  $4 \times 1$  MUX to implement the logic function :  
 $F(A, B, C) = \sum m(1, 2, 4, 7)$ .  
 (c) Design a synchronous 3-bit up counter using J-K F/F & draw its circuit diagram.  
 (d) What is the difference between Static RAM & Dynamic RAM ? 4+4+4+3
3. (a) With a neat sketch draw Cathode Ray tube and describe its each components.  
 (b) Write short note on Maxwell bridge.  
 (c) With proper circuit diagram describe the square wave generator. 5+5+5

### Group—B

Answer any *five* questions : 8×5

4. (a) Convert the following numbers to decimal numbers :  
 (i)  $(4057.06)_8$  ; (ii)  $(11011.101)_2$  ; (iii)  $5C7_{16}$ .  
 (b) Realize the AND gate using diode logic only.  
 (c) Convert the following into the gray number :  
 $3A7_{16}$   
 (d) What is De Morgan's theorem ? 3+2+2+1
5. (a) What is the advantage & disadvantage of CMOS ?  
 (b) Write short notes on :  
 (i) Propagation delay ; (ii) Noise Margin. 3+(2 $\frac{1}{2}$ +2 $\frac{1}{2}$ )

6. (a) Draw a circuit diagram of Master-Slave F/F & explain its principle of operation.
- (b) What is the difference between synchronous counter & asynchronous counter? 5+3
7. (a) What are the components in a standard power supply unit?
- (b) Discuss the principle of operation of a voltage regulator using transistor.
- (c) What do you mean by percentage regulation of a voltage regulator? 2+4+2
8. Give the structure and design method of a multi-range DC Voltmeter having 0 - 10V, 0 - 50V & 0 - 250V ranges. Assume the internal resistance of the basic meter is  $100\Omega$  & full scale current is 1mA. 8
9. (a) Describe the function generator circuit using block diagram.
- (b) What is the difference between dual beam CRO and dual trace CRO? 5+3
10. (a) Write short note on Q-meter.
- (b) How can a wave form be displayed in a CRO? 5+3
11. (a) What is the basic difference between ammeter and voltmeter?
- (b) Explain with a block diagram of the electronic counter in the Frequency Mode of operation. 2+6

**Group—C**

Answer any *five* questions : 4×5

12. Prove that : 2+2

$$(i) AB + \bar{A}C + BC = AB + \bar{A}C$$

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

13. Draw the logic diagram of a 4-bit directional shift register. 4

14. Design a variable half-wave rectifier circuit using an SCR. 4

15. Design a 4-bit comparator circuit. 4

16. Implement the following Boolean function using an 8:1 multiplexer considering D as the input and A, B and C as the selection lines : 4

$$F(A, B, C, D) = \sum m(0, 2, 3, 5, 8, 9, 10, 11)$$

17. Realize two outputs  $F_1$  &  $F_2$  using a 4×2 PROM : 4

$$F_1(A_1, A_0) = \sum m(0, 2)$$

$$F_2(A_1, A_0) = \sum m(0, 1, 3)$$

18. Describe the function of Horizontal and Vertical deflection systems in CRO. 4

19. What is the function of attenuator & vertical amplifier in case of CRO ? 4