

- (e) Simplify the following expression using K-map and implement the result with universal gates only

$$F(A, B, C, D) = \bar{A} \bar{B} \bar{C} + A \bar{C} \bar{D} + A \bar{B} + ABC \bar{D} + \bar{A} \bar{B} C$$

- (f) Simplify the following Boolean function using tabulation method :

$$f(w, x, y, z) = \Sigma m(1, 5, 6, 12, 13, 14) + \Sigma d(2, 4, 7, 9)$$

2 Attempt any **four** parts of the following : 5×4=20

- (a) Represent the decimal numbers '-21' in all four methods of negative binary number representation using eight bits.
- (b) Perform the following subtraction using 2's complement method :
- (1) 110100-10101
- (2) 0011.1001-0001.1110
- (c) Design a combinational circuit that converts a 3-bit Gray code to 3-bit binary number. Implement the circuit with exclusive **OR** gates.
- (d) Show that a full subtractor can be constructed with two half subtractor and an OR gate.
- (e) Implement the following Boolean function with a multiplexer :

$$F(A, B, C, D) = \Sigma m(1, 3, 4, 11, 12, 13, 14, 15)$$

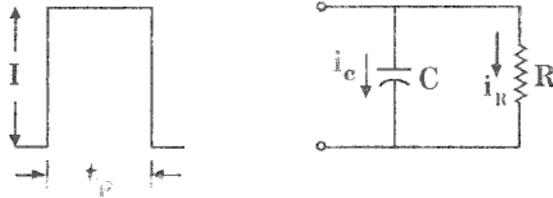
- (f) Explain the function of PLA with suitable example.

3 Attempt any **two** parts of the following : $10 \times 2 = 20$

- (a) Explain the differences among a truth table, a state table, a characteristic table and an excitation table of flip-flop.
- (b) What is shift register ? Explain the operation of a 4 bit shift register. The content of a 4 bit register is initially 1101. The register is shifted six times to the right with the serial input being 101101. What is the content of the register after each shift ?
- (c) Design a synchronous counter using J-K flip flops with the following repeated binary sequence : "0, 1, 3, 5, 7".

4 Attempt any **two** parts of the following : $10 \times 2 = 20$

- (a) Write short notes on the following :
 - (1) Read only memories
 - (2) Sequential memories.
- (b) A current pulse of amplitude I is applied to a parallel RC circuit as shown in figure below. Plot to scale (approximately) wave forms of the current i_c for the cases
 - (i) $t_p < RC$
 - (ii) $t_p = RC$ and
 - (iii) $t_p > RC$.



(c) Describe the successive approximation A/D conversion principle. Explain this type of A/D converter with the neat diagram.

5 Attempt any **two** parts of the following : $10 \times 2 = 20$

- What is higher order active filter ? Design a second order low pass filter at a high cut off frequency of 1 kHz.
- What are the basic modes in which the 555 timer operates ? Write few applications of 555 timer and explain any one in detail.
- Describe the fixed voltage IC regulators. Also explain the typical performance parameters for the voltage regulators.