

17333

14115

3 Hours / 100 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1. a) Attempt any **SIX** of the following: 12
- (i) Compare the digital system with analog system on four points.
 - (ii) Define:
 - 1) Propagation delay
 - 2) Noise margin
 - (iii) Draw the symbol and truth table of:
 - 1) EX-OR gate
 - 2) NAND gate
 - (iv) State the meaning of universal gate. Name the universal gates.
 - (v) Write the binary addition rules.

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Marks

- (vi) Define Duality theorem and give example.
 (vii) Draw the logic diagram of IC 7485.
 (viii) Compare R-2R and weighted resistor DAC on four points.

b) **Attempt any TWO of the following:** **8**

(i) Convert the followings:

1) $(93)_{10} = (?)_2$

2) $(9B)_{16} = (?)_{10}$

(ii) Construct the AND and OR gate using NAND gate. Write necessary outputs of gates.

(iii) Perform the BCD arithmetic:

1) $(264)_{10} + (668)_{10}$

2) $(454)_{10} + (379)_{10}$

2. **Attempt any FOUR of the following:** **16**

- a) State De-Morgan's theorems and prove for two inputs.
 b) Reduce the following logic expression using Boolean laws and De-Morgan's theorems

$$Y = \overline{A \cdot (A \cdot B)} \cdot B \cdot \overline{(A \cdot B)}$$

c) Perform 2's complement subtraction:

$(59)_{10} - (62)_{10}$

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Marks

- d) For the given K-map in Figure No. 1, write minimized SOP expression and for the same draw NAND-NAND logic circuit.

	$\bar{c}\bar{d}$	$\bar{c}d$	cd	$c\bar{d}$
$\bar{A}\bar{B}$	0	1	0	0
$\bar{A}B$	1	1	1	0
AB	1	1	1	0
$A\bar{B}$	0	0	1	0

Fig. No. 1

- e) Draw 8 : 1 multiplexer using basic logic gates.
 f) Construct full adder using basic logic gates and K-Map technique.

3. Attempt any FOUR of the following:

16

- a) Reduce the given logic expression using Boolean laws and draw NAND logic circuit.

$$Y = A + \bar{A} \cdot B + A \cdot B$$

- b) Construct 1 : 16 demultiplexer using only 1 : 4 demultiplexers.
 c) Draw the block diagram of BCD to seven segment decoder/driver using IC 7447. Also draw its truth table.

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- d) For the given K-Map in Figure No. 2, write the POS expression and draw NOR-NOR logic circuit for same.

	$\bar{c}\bar{d}$	$\bar{c}d$	cd	$c\bar{d}$
$\bar{A}\bar{B}$	0	1	1	1
$\bar{A}B$	0	0	0	1
AB	1	1	0	0
$A\bar{B}$	1	1	0	0

Fig. No. 2

- e) Draw the symbol and truth table of followings:
- D-flip flop
 - R-S flip flop
- f) Draw the circuit diagram of 4 bit asynchronous counter and explain with timing diagram.

4. Attempt any FOUR of the following:

16

- Draw 4 bit SISO shift register using D-flip flop and explain it's working with timing diagram.
- Compare dual slope and successive approximation ADC on:
 - Diagram
 - Working principle
- Construct D-flip flop using R-S flip flop and explain it's working along with truth table.
- Draw and explain the working of J-K flip flop with it's truth table.
- Draw and explain working of static RAM cell.
- With neat circuit diagram, explain the working of successive approximation ADC.

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Marks**5. Attempt any FOUR of the following:****16**

- a) Perform the binary arithmetic:
- (i) $(11011.11)_2 + (11011.01)_2 = (?)_2$
- (ii) $(11101.1101)_2 - (101.011)_2 = (?)_2$
- b) Explain the techniques used in elimination of 'Race-around' condition.
- c) Using Boolean laws, simplify the expression:
- $$Y = A (\overline{AC}) (\overline{AB} + \overline{C})$$
- d) Draw Master - slave J-K flip flop and explain it's working.
- e) Describe the operation of decimal to BCD encoder IC 74147 with its truth table and pin diagram.
- f) Define 'Modulus of counter'. Determine number of flip flops to be used in MOD-21 counter.

6. Attempt any TWO of the following:**16**

- a) (i) Define and draw the logical symbol of multiplexer.
- (ii) Find the reduced form of following function.
- $$f(A, B, C) = \Sigma m(2, 3, 4, 5, 6, 7)$$
- using K-map and draw logic circuit.
- b) (i) List four applications flip flops.
- (ii) Compare synchronous and asynchronous counter on any two points.
- (iii) Convert JK-flip flop in to T-flip flop. Write it's truth table and explain.
- c) (i) List any four specifications of DAC.
- (ii) Draw neat block diagram of Ramp ADC and explain its working.