17475

15162

3 Hours / 100 Marks Seat No. | | | | | | | | |

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) Assume suitable data, if necessary.

(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1. Attempt any FIVE : **4 × 5 = 20**

(a) State advantages and disadvantages of digital systems.

(b) Convert :

(i) $12.8_{(10)}$ to binary no.

(ii) 423 (BCD) to binary no.

(c) Draw symbols and write truth table for following gates :

(i) NAND gate

(ii) EX-NOR gate

(d) Simplify given functions using k-map, $p = \Sigma_m (1, 2, 3, 8, 12)$; $q = \Sigma_m (0, 3, 5, 8, 14)$.

(e) Compare : Combinational circuits with sequential circuit. (any four points)

(f) State and explain specifications of DAC.

(g) Give classification of ROM and RAM.

2. Attempt any FOUR : **4 × 4 = 16**

(a) Simplify given expression using boolean algebra, de-Morgan's theorem and draw the simplified circuit using NAND gates.

$n = xy\,\overline{z} + y\overline{z} + \overline{x}\,yz + \overline{x}\,\overline{y}\,\overline{z}$

(b) Draw the block diagram of digital comparator (IC 7485) and write its truth table.

(c) Design half adder using NAND gates only.

(d) List triggering methods for flip-flop. Explain positive and negative edge triggering methods.

(e) Shift registers are considered as basic memory devices, justify your answer with suitable example.

(f) With block diagram, explain working 3-bit binary down counter.

3. Attempt any TWO : 8 × 2 = 16

(a) (i) Perform $81_{(10)} - 92_{(10)}$ in binary using 2's compliment method.

(ii) Compare TTL with CMOS family with reference to power supply, fan-out, power dissipation and speed.

(b) Draw neat circuit diagram of 16 : 1 multiplexer using NAND gates. Write its logical equation and truth table. State the need of MUX.

(c) Draw and explain successive approximation type ADC and state its advantages and draw backs.

4. Attempt any TWO : 8 × 2 = 16

(a) Solve :

(i) Convert 1100 0101 1100 GRAY code to Binary.

(ii) Convert $59_{(10)}$ to Octal & Hexadecimal.

(iii) Subtract 10101 from 01111 (using 1's compliment method)

(iv) Add : 11111 (2) + 01110 (2)

(b) State need of DEMUX. Explain logic diagram of 1 : 8 DEMUX using NAND logic, with its truth table. Also, state the difference between DEMUX & decoder.

(c) List different types of DAC techniques and explain any of them with the help of circuit diagram. State drawbacks of used technique.

5. Attempt any TWO : **8 × 2 = 16**

(a) List any four laws of boolean algebra :

(i) Draw logic circuit for Boolean expression $y = A\bar{B}C + \overline{AB}$ using basic gates.

(ii) Simplify $y = \bar{A}B + ABC + \overline{AB}CD$ using k-map.

(b) Draw circuit diagram of J-K f/f using NAND gate S. Explain its working with truth table. What is race-around condition ? How it can be overcome ? List the methods to be used for avoiding race-around condition.

(c) (i) Compare : Synchronous counter with Asynchronous counter by four points.

(ii) Draw pin diagram of universal shift reg. IC (7495) and list its applications.

6. Attempt any FOUR : **4 × 4 = 16**

(a) Convert the expression in POS form : $K = P\bar{Q}R + \bar{P}QR + PQRS + P\bar{S}$. Draw POS & SOP logic circuit.

(b) Explain operation of full adder using half adders.

(c) Draw the block diagram for BCD to 7-segment decoder (IC 7447) & draw its truth table.

(d) State & prove de-Morgan's theorem.

(e) Implement OR and EX-OR gates using NAND gates.

(f) Draw the logic diagrams & write truth tables for D-f/f & T-f/f.

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