17333

16172

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) Figures to the ***right*** *indicate* ***full*** *marks.*
(5) Assume suitable data, if ***necessary****.*
(6) Use of Non-programmable Electronic Pocket Calculator is ***permissible****.*
(7) Mobile Phone, Pager and any other Electronic Communication devices are ***not*** *permissible in Examination Hall.*

Marks

1. A) Attempt **any six**: **(6×2=12)**

i) Draw truth table for NAND and NOR gates.
ii) Compare analog signal with digital signal according to nature/shape of signals and application.
iii) State any two Boolean laws with expression.
iv) Perform "BCD addition" for (2375) + (4933) = ?
v) State the difference between Half and Full adder.
vi) Write any four applications of counter.
vii) State application of MUX and De-MUX.
viii) Draw symbol of J-K flip-flop and write its truth table.

B) Attempt **any two**: **(4×2=8)**

i) List types of digital to analog converters and state specifications of ADC (any four).
ii) Describe classification of memories.
iii) State and explain De-morgan theorems.

2. Attempt **any four**: **(4×4=16)**

a) Convert following number into its equivalent = $(146.25)_{10}$.
   i) Binary number
   ii) Octal number respectively.

b) Draw symbol and truth table for (i) 3 i/p OR gate (ii) 2 i/p EX-NOR gate.

c) Implement the following logic expression using 16 : 1 MUX $Y = \sum m(0, 3, 5, 6, 7, 10, 13)$.

d) Draw block diagram of decimal to BCD encoder and write its truth table.

e) Compare combinational and sequential circuits (four points).

f) Draw circuit diagram of successive approximation type ADC and explain its working.

P.T.O.

Marks

3. Attempt **any four**: **(4×4=16)**

a) Perform binary subtraction using 2's complements of following :
   i) $(63)_{10} - (20)_{10} = ?$ ii) $(34)_{10} - (48)_{10} = ?$

b) Simplify the following and realize it $Y = A + \overline{A}\overline{B}C + \overline{A}\,\overline{B}\overline{C} + ABC + \overline{A}\overline{B}$.

c) Explain full adder with logic diagram and its truth table and proper expressions.

d) Draw diagram of BCD to segment decoder using IC 7447 with truth table.

e) Describe the operation of RS Flip Flop using NAND gates only.

f) State advantages and disadvantages of (i) Ramp type ADC (ii) Dual slope type ADC.

4. Attempt **any four**: **(4×4=16)**

a) Construct 16 : 1 multiplexer using 4 : 1 multiplexer. Draw diagram.

b) What is race around condition ? How can it be overcome ?

c) Draw AND, OR, NOT logic gates using any one of the universal gates and write its expressions.

d) Draw R-2R ladder digital to analog converter and explain its working.

e) Describe following number systems with respect to their base/radix, digits/symbols and its example. (i) Octal number (ii) Hexadecimal number.

f) What is modulus counter ? Design MOD-7 counter using IC 7490.

5. Attempt **any four**: **(4×4=16)**

a) Compare CMOS and TTL Logic families.

b) Draw and explain working of Hex to binary encoder with truth table.

c) Explain the operation 3-bit asynchronous counter with diagram.

d) Draw labeled block diagram of 74181 ALU.

e) Draw circuit diagram and explain working principle of dual-slope type ADC.

f) Draw proper labeled diagram of parallel in parallel out (4 bit) shift register and explain its working.

6. Attempt **any two**: **(8×2=16)**

a) Reduce following Boolean expression using laws and theory of Boolean algebra.
   i) $A + BC = (A + B)(A + C)$.
   ii) $Y = (A + \overline{B})(\overline{A} + B)(A + B)$.

b) i) Implement 1 : 16 demultiplexer using 1 : 8 demultiplexer.
   ii) Explain working of full substractor with circuit diagram.

c) i) Compare synchronous and asynchronous counter.
   ii) Design a mod-10 synchronous counter.