POKHARA UNIVERSITY

Level: Bachelor | Semester: Fall | Year : 2021
Programme: BE | Full Marks: 100
Course: Logic Circuits | Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Explain briefly about 7
   (i) instruction code,
   (ii) Hexadecimal code, and
   (iii) Alphanumeric code.
   b) Perform the conversions as indicated (any two). 4
   i. $(556)_4 = (?)_{Excess\text{-}3}$
   ii. $(786)_{10} = (?)_{BCD}$
   iii. $(437.126)_8 = (?)_2$
   c) Using (r-1)'s complement perform subtraction: $(1010100)_2 - (1000100)_2$. 4
2. a) Convert the following to the other canonical form. 8
   i. $F(x,y,z) = \Sigma(1,5,7)$
   ii. $F(A, B, C, D) = \Sigma(1, 2, 7,11,12, 14)$
   iii. $F(x,y,z) = \Pi(0, 4, 6, 7)$
   iv. $F(A, B, C, D) = \Pi(0, 1, 2, 3, 4, 6, 12)$
   b) Design a logic circuit to implement the Boolean function. 7
   $F(A,B,C.D)=\sum(1,3,4,5,7,9,13,14,15)$
   $D(A,B,C,D)=\sum(0,2,8)$
   i. Sum of product
   ii. Implement with NAND-NAND gate only.
3. a) Design a combinational circuit with three inputs and one output. 8
   i. The output is 1 when binary value of the inputs is less than or equal to 3. The output is 0 otherwise
   ii. The output is 1 when the binary value of the inputs is an odd number.

iii. The output is 1 when the binary value of the inputs is an even number.

OR

Design a combinational logic circuit with 3 inputs that provide 1 output when exactly two variables are 1. 7

b) Construct 8×1 Mux using 4×1 MUX & explain with truth table.

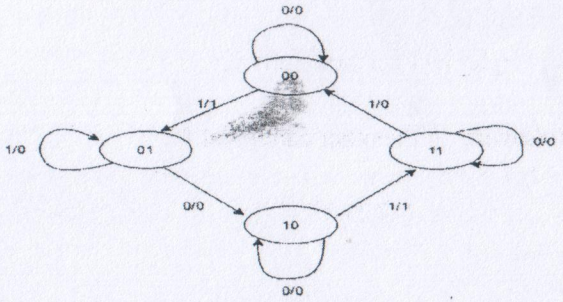
4. a) Implement the following three Boolean function with a PLA 8
$F_1 = \sum(0,1,3)\ F_2 = \sum(1,3,4,7)\ F_3 = \sum(0,2,5,6)$

OR

Design a BCD to excess -3 code converter and implement using suitable PLA.

b) Explain operation of **JK** Flip-flop with its logic diagram, truth table, excitation table. Why **JK** flip-flop is preferred over **RS** flip-flop? 7

5. a) Realize the following state diagram into a circuit using **T** flip-flop. How can you replace **T** flip-flops of your final circuit with **JK** flipflops? 8



7

b) Design a circuit for synchronous MOD - 7 counter.

6. a) What are shift registers? Explain Parallel in Parallel out (PIPO) and Serial in Parallel out (SIPO) shift register with diagrams. 7
   b) Design an ALU which performs eight arithmetic and four logical operations. 8
7. Write short notes on: (**Any two**) 2×5
   a) Johnson (Switch tail ring) Counter
   b) State reduction.
   c) Grey code as reflected code.