B. Tech.

(SEM. IV) EXAMINATION, 2006-07

LOGIC CIRCUITS

Time : 3 Hours] [Total Marks : 100

Note : (1) Answer all questions.
(2) All questions carry equal marks.

1 Attempt any two parts of the following : 10×2=20
   (a) Minimize the following function by Tabular method.

   \[ f(w, x, y, z) = \sum(0,1,4,5,6,7,9,10,11,14,15) \]

   (b) (i) Perform the following subtraction using q’s complement method.

   \[ 0011 \cdot 1001 - 0001 \cdot 1110 \]

   (ii) Explain with example how don’t care conditions are implemented in K-map minimization.

   (c) Design a combinational circuit that compares two 4-bit number A and B to check if they are equal or not.

2 Attempt any two parts of the following : 10×2=20
   (a) What are synchronous and asynchronous sequential circuits? Write the procedure for the analysis of a sequential circuit.

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(b) A sequential circuit with two D flip-flops A and B, two inputs x and y, and one output Z, is specified by the following next state and output equations:

\[ A(t+1) = x'y + xA \]
\[ B(t+1) = x'B + xA \]
\[ Z = B \]

(i) Draw the logic diagram of the circuit.
(ii) Derive the state table.
(iii) Derive the state diagram.

(c) What is race condition in an asynchronous sequential circuit? Discuss the concept of non-critical race with examples.

3 Attempt any two parts of the following: \(10 \times 2 = 20\)

(a) What is meant by wired AND connection of digital ICS? What is its advantage? Draw a circuit of TTL gates with wired AND connection.

(b) Draw the circuit diagram of CMOS NOR gate. Explain its operation.

(c) Explain what is meant by logic family? Explain the parameters used to characterise logic families.

4 Attempt any two parts of the following: \(10 \times 2 = 20\)

(a) Draw the low pass RC circuit and plot the output response for application of sinusoidal input. Explain the upper 3-dB frequency.
(b) Why integrator circuits are preferred over differentiators in analog computer applications.

(c) Draw the input and output characteristics of MOS transistor. How will you use it as switching element? Explain.

5 Attempt any two parts of the following: 10x2=20

(a) What do you mean by universal shift register? Draw the circuit diagram of a universal shift register and explain its working.

(b) Draw the logic diagram of a 4 bit binary ripple counter using flip-flop that trigger on the positive edge transition.

(c) Design a synchronous BCD counter with JK flip flops.