B. Tech.
(SEM. III) EXAMINATION, 2008-09
SWITCHING THEORY

Time : 3 Hours] [Total Marks : 100

Note : (i) All questions carry equal marks.
(ii) All questions are compulsory.

1 Attempt any four of the following : 5 x 4 = 20

(a) How many bits of memory are required for storing 100 names of a group of people, assuming that no name occupies more than 20 characters (including space)? Assume 7-bit ASCII code with parity bit.

(b) Encode the decimal number 46 to Gray code.

(c) Determine Hamming code sequence with odd parity for natural BCD for making it an error correcting code.

(d) Realize a 3-input gate using 2-input gates for the following gates:
   (i) AND (ii) OR (iii) NAND (iv) NOR.
(e) Consider the expression:
\[ Z = A \oplus B \oplus C \oplus D \oplus \ldots. \]
Show that \( Z = 1 \) if an odd number of variables are 1 and \( Z = 0 \) if an even number of variables are 1.

(f) Realize the following function using \( EX-OR \) and \( EX-NOR \) gates?
\[ f = ABCD + AB\bar{C}D + \bar{A}\bar{B}CD + \bar{A}BCD. \]

2 Attempt any four parts of the following:

(a) Design a parity generator to generate even parity bit for a 4 bit word. Use \( EX-OR \) and \( EX-NOR \) gate.

(b) Design a \( BCD \) to Excess-3 code converter using minimum number of NAND gates.

(c) Implement the following function using a 4-to-16 line decoder:
\[ f = \sum m(1, 2, 4, 7, 8, 11, 12, 13). \]

(d) Present an algorithm for performing subtraction using adder.

(e) Implement the expression using a multiplexer
\[ f(A, B, C, D) = \sum m(0, 2, 3, 6, 8, 9, 12, 14). \]

(f) Design a \( BCD \)-to-seven segment decoder using a PAL.
3 Attempt any two of the following: \(10 \times 2 = 20\)

(a) Describe and discuss the operation of a T-type flipflop.

(b) Design a 3-bit binary UP/DOWN counter with a direction control \(M\), using J-K flip-flops.

(c) Design a circuit using J-K ffs for the state diagram.

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

(a) Draw and explain "an output circuit arrangement" for explaining "Totem-pole" output for TTL gates.

(b) Distinguish between static and dynamic hazard. How will you determine hazard in combinational circuits?
(c) Explain the operation of wired-OR connections of ECL gates?

5 Attempt any two of the following: $10 \times 2 = 20$

(a) Obtain a $16 \times 8$ memory using $16 \times 4$ memory ICs and draw the concerned IC circuit.

(b) Explain: Coincident selection addressing.

(c) Draw the circuit for Bipolar RAM cell and explain its operation, in brief.