This question paper contains 4 printed pages]

Your Roll No. .....

1973

B.Sc. (Hons.) (Computer Science)/I Sem. C

Paper 104—DIGITAL ELECTRONICS

(Admissions of 2001 and onwards)

Time : 3 *Hours* *Maximum Marks* : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *all* questions.

Part of a question must be answered together.

1. (*a*) Convert the following : 2

(*i*) $(129.375)_{10} = (\ \ )_2$

(*ii*) $(3A7B)_{16} = (\ \ )_8$.

(*b*) What is radix (base) that satisfies the following equation : 2

$$(53)_r + (120)_r = (213)_r$$

P.T.O.

(*c*) Express the following function in both the canonical forms : 2

$$f = (W.X' + Y.Z')\ (W'.Z + X.Y').$$

(*d*) Implement a full adder using 3 to 8 decoder. 2

(*e*) What is race around condition in JK flip-flop and how it can be removed ? 2

(*f*) Convert a J-K flip-flop into a D flip-flop as well as T flip-flop. 2

(*g*) Differentiate between static and dynamic RAM. 1

(*h*) Subtract $(125)_{10}$ from $(200)_{10}$ using complement method. 2

2. (*a*) Simplify the following function in SOP form and realize it using universal gate : 7

$$F = \Sigma m\,(0, 2, 3, 10, 12, 16, 17, 18, 21, 26, 27) + d\,(11, 13, 19, 20)$$

(*b*) Reduce the following expression using Boolean algebra : 5

$$F = (W.X + W.Y')\ (W + X) + W.X.\ (X' + Y').$$

3. (*a*) Design a 4-bit BCD adder circuit using two 4-bit binary adders and a correction detector circuit. 7

(*b*) Implement following function using 4 × 1 MUX and external gates : 5

$$F = \pi(0, 2, 3, 8, 9, 13, 15).$$

4. (*a*) Design a sequential circuit with two JK flip-flop A and B and two inputs E and x. If E = 1, the circuit remains in the same state regardless of the value of x. When E = 0 and x = 0, the circuit goes through the state transition from 00 to 01 to 10 to 11, back to 00, and repeats. When E = 0 and x = 1, the circuit goes through the state transition from 00 to 11 to 10 to 01 and back to 00 and repeats. 7

(*b*) An XY flip-flop has 4 operations set to 1, complement, no change and set to 0 when X and Y inputs are 00, 01, 10 and 11 respectively. Tabulate its characteristic table and excitation table. Derive its characteristic equation. 5

5. (*a*) Design a synchronous counter using T flip-flop that goes through states : 7

$$0 \rightarrow 3 \rightarrow 5 \rightarrow 6 \rightarrow 0$$

(*b*) Construct a 32 × 1 MUX using 8 × 1 MUX and a 4 × 1 MUX. 5

6. (*a*) Draw and explain an architecture of 16 × 8 ROM. 6

(*b*) A certain memory stores 8K 16-bit words. How many data input and output lines lines does it have ? How many address lines does it have ? What is its bit capacity ? 6