Total No. of Questions : 8 ] [ Total No. of Printed Pages : 4

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# CS/EI/BM–303(N)

## B. E. (Third Semester) EXAMINATION, Dec., 2010

(New Scheme)

(Common for CS/EI/BM Engg. Branch)

DIGITAL CIRCUITS AND SYSTEMS

*Time : Three Hours*

*Maximum Marks : 100*

*Minimum Pass Marks : 35*

**Note :** There are eight questions. Attempt any *five* questions. All questions carry equal marks. Make suitable assumptions wherever necessary.

1. (a) (i) Using 9's complements, subtract (63458 – 3354). 4

(ii) Express decimal 5280 in excess-3 code. 4

(b) Minimize the following switching functions using the Karnaugh map. List all prime implicants and essential prime implicants : 12

$$F(x_1, x_2, x_3, x_4) = \Sigma (0, 1, 2, 3, 6, 7, 9, 13, 14, 15)$$

2. (a) Minimize the following functions using the Quine-McCluskey method. 14

$$F(x_1, x_2, x_3, x_4, x_5) = \Sigma (0, 2, 4, 5, 6, 7, 8, 10, 14, 17, 18, 21, 29, 31) + \Sigma_d (11, 20, 22)$$

(b) Convert the following : 6

(i) $(0{\cdot}513)_{10}$ to octal

P. T. O.

(ii) $(673 \cdot 124)_8$ to binary

(iii) $(1010 \cdot 01101)_2$ to decimal

3. (a) Determine the prime-implicants of the function and minimized function : 10

$$F(w, x, y, z) = \Sigma (1, 4, 6, 7, 8, 9, 10, 11, 15)$$

(b) Design a parity generator to generate an odd parity bit for a 4-bit word. Use NAND gates only. 10

4. (a) Design a Full-Adder with two Half-Adders and an OR gate. 9

(b) Design a BCD to Excess-3 code converter using the minimum number of NAND gates. 11

5. (a) Explain the operation of monostable multivibrator with the help of necessary diagrams and waveforms. Describe the applications of it. 12

(b) Determine the frequency of oscillation for the free running multivibrator circuit shown below. It is given that RA = RB = 1 k Ω and C = 1000 pF. Also calculate the duty cycle. 8

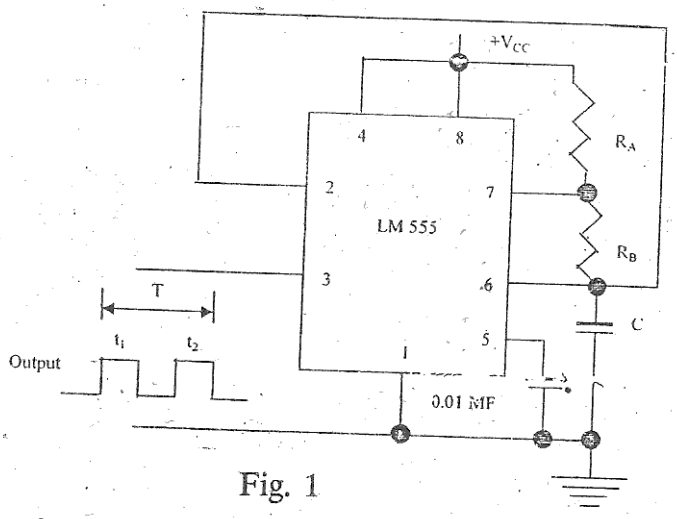


Fig. 1

6. (a) How many flip-flops are required to construct a mod-128 counter ? A mod-32 ? What is the largest decimal number that can be stored in a mod-64 counter ? 3

(b) What modulus counters can be constructed with the use of four flip-flops ? 3

(c) Draw the waveform expected from the mod-6 counter by connecting a single flip-flop in front of mod-3 counters in figure given below. 4

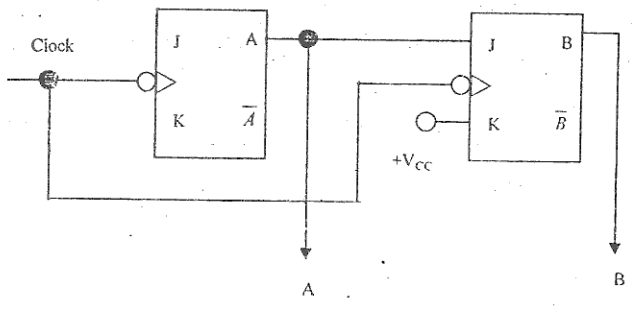


Figure (a): Logic Diagram

Fig. 2 (a) Logic Diagram

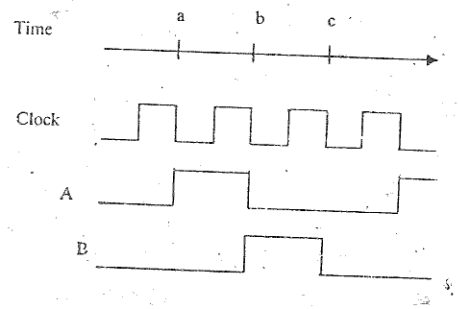


Fig. 2 (b) Logic Diagram

(d) Design a 4-bit Johnson counter. 10

P. T. O.

7. (a) Describe the successive approximation A/D converter with the help of necessary diagram and waveforms. 10

   (b) For a 5-bit resistive divider, determine the following : 10

   (i) the weight assigned to the LSB.

   (ii) the weight assigned to the second and third LSB.

   (iii) the change in output voltage due to a change in the LSB, the second LSB and third LSB.

   (iv) the output voltage for a digital output of 10101.

   Assume 0 = 0 V and 1 = + 10 V.

8. Write short notes on any *three* of the following : 20

   (a) Sample and Hold circuit

   (b) 2-bit simultaneous A/D converter

   (c) PLA

   (d) ECL