## 10312 : Analog & Digital ICs : 4 KS 02 / 4 KE 02

P. Pages : 2

Time : Three Hours

AW - 3043

Max. Marks : 80

Notes : 1. Due credit will be given to neatness and adequate dimensions.
2. Assume suitable data wherever necessary.
3. Illustrate your answer necessary with the help of neat sketches.
4. Use of pen Blue/Black ink/refill only for writing the answer book.

1. a) Define the following terms for Op-Amp                                                          6
   i) Input offset voltage          ii) CMRR
   iii) Slew Rate

   b) Draw the circuit of Inverting Amplifier using Op-Amp. Also derive the equation for gain        7
   of this circuit.

**OR**

2. a) Draw the circuit of Differentiator using Op – Amp. Derive the expression for output            7
   voltage. Also draw the output waveform if the input is square wave.

   b) Determine the output voltage for the circuit shown in fig. 2 (b) for $V_1 = 1V$ and $V_2 = 3V$.   6
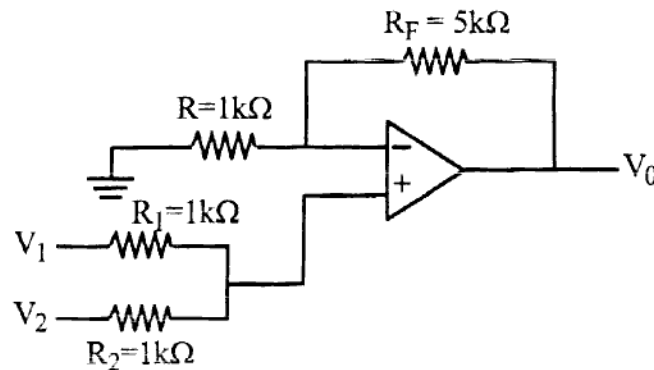


3. a) Draw the block diagram of PLL and explain the function of each block.                           6

   b) Draw and explain block diagram of Timer IC – 555 and list its applications.                    7

**OR**

4. a) Draw the circuit for square wave generator using IC – 555. Explain the operation alongwith     7
   waveforms. Derive the expression for Time period of output square wave.

   b) With neat diagram explain the application of PLL as a frequency converter.                     6

5. a) Express the following numbers into BCD and Excess – 3 codes.                                    6
   i) $(158)_{10}$
   ii) $(101011)_2$

b) i) Convert $(10101101)_2$ to Gray Code. 8

ii) Convert $(162.862)_{10}$ into Binary.

**OR**

6. a) Explain Gray code and excess – 3 code with examples. Give application of Gray Code. 7

b) Represent the decimal number 62 in following various codes. 7

i) Binary Code        ii) BCD Code

iii) Excess 3 Code      iv) Gray Code

v) Octal Code        vi) Hexadecimal Code

7. a) Simplify the following function using k – map. 7

$$f = \Sigma m(0,1,2,3,5,7,9) + d(11,13,14,15)$$

b) Simplify the following Boolean function using k-map & implement it using NAND gates only 7

$$f = \Sigma m(1,2,3,5,6,7,8,9,12,13,15).$$

**OR**

8. a) Simplify the following function using Tabulation method. 10

$$f(A,B,C,D) = \pi M(0,2,4,6,8,9,12,13)$$

b) Implement the following Boolean function with NOR – NOR logic. 4

$$f(x+y+z) = (\overline{x} + \overline{y} + \overline{z})$$

9. a) Design 40 : 1 multiplexer using 8 : 1 multiplexers. 7

b) Implement the combinational circuit for the following functions using PLA. 6

$$f_1 = \Sigma m(1,3,7)$$
$$f_2 = \Sigma m(2,5,6)$$

**OR**

10. a) What is Full Adder? Draw the circuit using two half address and a suitable gate. Explain the same with truth table. 7

b) Implement the following functions using decoder. 6

$$f_1 = \Sigma m(0,1,3,4,6)$$
$$f_2 = \Sigma m(1,2,5,7)$$

11. a) Draw the circuit of 3 – bit ripple up counter along with its timing diagram. 6

b) What is Race around condition? Suggest suitable method to eliminate it and explain the same. 7

**OR**

12. a) Draw the circuit and explain the operation of Johnson Counter. 6

b) State different types of shift registers. Explain the operation of 3 bit shift register with neat diagram. 7

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