

EP-403 - Analog & Digital Circuits

P. Pages : 2

Time : Three Hours

**GUG/W/16/3892**

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Assume suitable data wherever necessary.
 3. Diagrams and Chemical equation should be given wherever necessary.
 4. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Simplify Boolean equations using K – map 8
 - i) $f(A,B,C) = \bar{A}.B.C + \bar{A}.B.\bar{C} + \bar{A}.B$
 - ii) $f(A,B,C,D) = \sum m(0, 1, 4, 6, 7, 8, 14, 15)$
- b) Describe the operations performed by full subtractor? implement the same by using NAND Gate. 8

OR

2. a) Design 4 – bit BCD to EXCESS – 3 code converter. 8
- b) Design 4 bit prime number detector combinational circuit. 8
3. a) Explain JK flip flop with its characteristic table and excitation table. 8
- b) Convert SR FF to JK FF. 8

OR

4. a) Explain 2 bit Asynchronous counter with timing diagram. 8
- b) Design a mod – 5 counter using JK FF Is counter self starting. 8
5. a) What is slew Rate? List out the causes that affect slew Rate and explain the significance of slew Rate in applications. 8
- b) The op – amp used as non inverting amplifier has following specifications 8

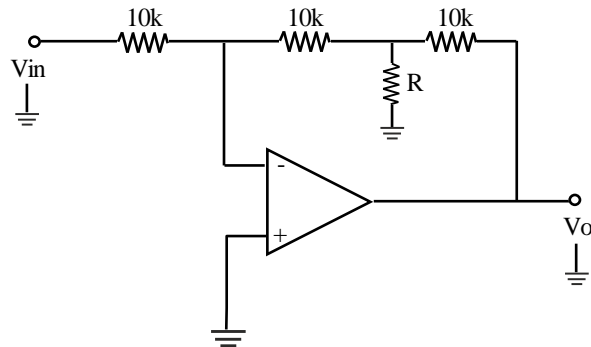
$$\frac{\Delta V_{io}}{\Delta T} = 30 \mu V / ^\circ C, \quad \frac{\Delta I_{io}}{\Delta T} = 10 nA / ^\circ C$$

The amplifier is nulled at 25°C and uses $R_1 = 100 \Omega$ and $R_f = 8.2 K\Omega$ if a 20 mv peak sine wave at 100 Hz is applied as input, calculate error voltage and output voltage at 45°C and Draw the output voltage waveform at 25°C and 45°C.

OR

6. a) Define following w.r.t. OP – AMP: 4
 - i) supply voltage Rejection Ratio
 - ii) Input offset current
 - iii) Gain bandwidth product
 - iv) CMRR.

- b) Discuss the concept of level translator in differential amplifier. 6
- c) Explain the significance of constant current bias in differential amplifier. 6
7. a) For the circuit shown in fig. 7(a). Find the value of 'R' required to obtained $V_o = -50 V_{in}$ 8



- b) What is precision rectifier? Draw the full wave rectifier & Explain its operation. 8

OR

8. a) Design an OP – AMP based circuit to implement following expression where V_o is output and V_1, V_2, V_3 are input voltages: 8

$$V_o = -\int V_1 dt - \frac{1}{1.5} \int V_2 dt - \frac{1}{0.5} \int V_3 dt$$

- b) Give the circuit diagram of an instrumentation amplifier using three op – amps and derive the expression for it's output voltage. 8
9. a) Draw the circuit of practical logarithmic amplifier. Derive the expression for output voltage. 8
- b) Design a 2nd order active high pass Butterworth filter with Cut – Off frequency 15 KHz. 8

OR

10. Write short notes on **any two**. 16

- Schmitt trigger
- Wien bridge oscillator
- IC 555
