B.Tech. V Semester Examination, Dec-2022

Subject Name: Integrated Circuits **Subject Code: TEC-352**

Branch: Electronics & Communication Engineering

Time: 3Hrs. **Maximum Marks: 120**

Note : Draw Figures wherever necessary.

1. Answer the following questions. (Very Short Answers) (5x2=10Marks)

(a) What is a super diode? Why is it required?

(b) List (any four) advantages of active filters over the passive filters?

(c) What is the difference between a basic comparator and the Schmitt trigger?

(d) What is the difference between pseudo homo epitaxy and hetero epitaxy?

(e) What are basic difference between Bipolar and MOS integrated circuits?

2. Answer the following questions. (Short Answers) (5x4=20Marks)

(a) Draw the circuit diagram of a basic log op-amp and derive the input-output relationship for the same.

(b) Design a 1^{st} order low-pass filter having a cut-off frequency of 1 kHz and a passband gain of 2.

(c) Design the square-wave oscillator using op-amp so that fo = 1 kHz. The op-amp is a 741 with dc supply voltages = ±15V.

(d) What are the various steps used in the preparation of Si wafers?

(e) Briefly explain dc sputtering method of metallization.

3. Answer the following questions. Part (a) is compulsory and attempt any one part (b) or part (c).

(a) What are precision rectifiers? What are its advantages over conventional rectifier? **(1x6=6Marks)**

(b) With the help of a neat circuit diagram explain the working of sample and hold circuit. Also sketch the input and output waveforms. **(1x12=12Marks)**

OR

(c) Draw the circuit diagram of Instrumentation amplifier and explain its working. Find the expression for its output voltage. List the important features of instrumentation amplifier. **(1x12=12Marks)**

4. Answer the following questions. Part (a) is compulsory and attempt any one part (b) or part (c).

(a) What is slew rate? Deduce an expression for the slew rate of an op-amp. What are causes of slew rate? **(1x6=6Marks)**

(b) Design a 60 Hz active notch filter, also draw the frequency response of the filter. Obtain the transfer function for narrow band reject filter. **(1x12=12Marks)**

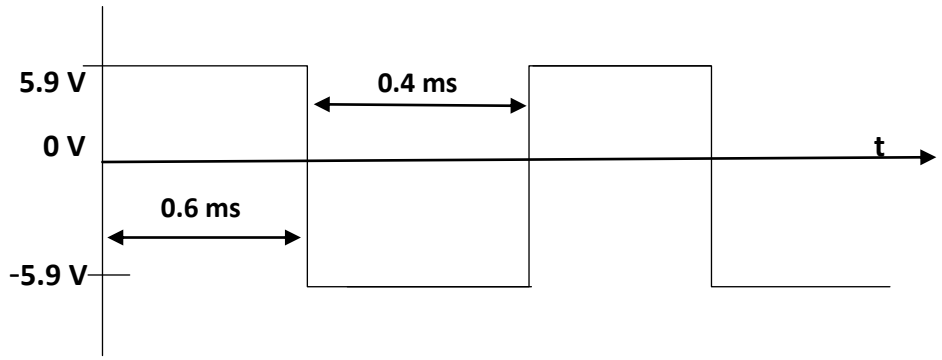
OR

(c) Design a second-order low-pass filter at a high cut off frequency of 1 kHz. Also, draw the frequency response of the obtained filter. **(1x12=12Marks)**

5. Answer the following questions. Part (a) is compulsory and attempt any one part (b) or part (c).

(a) What is a regenerative comparator? What is the importance of introducing Hysteresis in Schmitt trigger? **(1x6=6Marks)**

(b) With the help of a circuit diagram explain the monostable operation of a 555 timer. Draw the related waveforms. Design a circuit to generate the following waveform. **(1x12=12Marks)**



OR

(c) Draw the circuit diagram of triangular wave generator and explain its operation. Also derive the expression for f_0 . **(1x12=12Marks)**

6. Answer the following questions. Part (a) is compulsory and attempt any one part (b) or part (c).

(a) Derive the diffusion equation. How the depth of diffusion is controlled during diffusion process? **(1x6=6Marks)**

(b) Describe CZ process in detail with neat diagram. What is the Pull Rate in CZ technique? How the Pull Rate is controlled during CZ crystal growth process? **(1x12=12Marks)**

OR

(c) What is epitaxy? Discuss Molecular Beam Epitaxy technique in brief. What are the advantages of MBE over VPE? **(1x12=12Marks)**

7. Answer the following questions. Part (a) is compulsory and attempt any one part (b) or part (c).

(a) Explain the metallization and describe the problems associated with this process. **(1x6=6Marks)**

(b) Explain various steps of Lithography with suitable diagrams. Also classify Lithography techniques. **(1x12=12Marks)**

OR

(c) With the help of neat diagrams explain the process of CMOS IC fabrication. **(1x12=12Marks)**

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