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RE-3593-94

M. Sc. (Part - II) Examination

April / May – 2010

Electronics : Paper - II

(Integrated Circuit & Integrated Circuits Technology)

Time : Hours] [Total Marks : **52**

RE-3593

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ M. SC. - 2

Name of the Subject :

☛ ELECTRONICS - 2

☛ Subject Code No. : 3 5 9 3 ☛ Section No. (1, 2,.....) : 1

Seat No. :

Student's Signature

(2) Answers to the two sections must be written in separate answer books.

(3) Figures to the right indicate full marks.

(4) Assume the data if required.

(5) Symbols used have their usual meaning.

1 (a) Draw the block diagram of a typical op-amp and explain its four block in short. **2**

(b) In an open loop differential amplifier the inputs are at 1.1V and 1.0 V. What would its output voltage be? Draw its diagram using IC 741. **2**

(c) Compare the inverting and non inverting amplifiers in the following respects. **2**

(i) Gain

(ii) Minimum Gain

(iii) Input resistance

(iv) Output resistance.

(d) Define input offset current, CMRR, output voltage swing and slew rate for op-amps. **2**

2 (a) Draw the schematic diagram of a peaking amplifier and explain its working. Also draw its frequency response curve. **4**

(b) Design a circuit which can produce average of four voltage signals. How can this circuit be modified to produce the sum of inputs? 4

(c) Draw the circuit of a current-to-voltage converter using DAC and write expression for its output. 1

OR

2 (a) What are the characteristics of an instrumentation complfier? Draw the circuit diagram of a typical instrumentation amplifier and explain its working. Explain its application in light intensity meter. 5

(b) A 10-bit resistive divider is constructed such that the current through the LSB resistor is 100 μA. Determine the maximum current that will flow through the MSB resistor. 4

3 (a) What is an all pass filter? Where and why is it needed? 1

(b) Design a second order low pass filter at a high cut-off frequency of 1 KHz and a pass band gain of 1.58, where R_1 = 27 KΩ and C_2=C_3=0.0047 μF. Draw the frequency response of it. 4

(c) What is a comparator? How does feedback introduce hysteresis in a comparator? What are the advantages and applications of such a comparator? 4

OR

3 (a) Compare the successive approximation and dual slope methods of analog-to-digital conversion. Explain their advantages and disadvantages. 4

(b) Draw the circuit diagram of wien bridge oscillator and explain it. Derive the expressions for frequency of oscillation and gain. 5

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Name of the Examination :

☛ M. SC. - 2

Name of the Subject :

☛ ELECTRONICS - 2

☛ Subject Code No. : 3 5 9 4 ☛ Section No. (1, 2,.....) : 2

Seat No. :

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4 (a) Discuss the steps involved in obtaining highly pure polycrystalline electronics grade silicon (EGS). From crude naturally occurring silica and silicates. **3**

(b) Define reactive plasma etching. **3**

(c) Boron atoms concentration in solid silicon ingot at 6% doping level is 1.5×10^{17} atmos/cm^3. Calculate the boron concentration in the crystal at a fraction solidification. (segregation coefficient of boron in silicon is 0.8). **4**

5 (a) Describe Czochralski crystal growing theory, with schematic diagram representing the growth process. Also derive equation for maximum pull rate. **5**

(b) An x-ray exposure system uses photons with energy of 1 KeV. If the separation between the mask and wafer is 20 μm, estimate the diffraction-limited resolution that is achievable by this system. **3**

OR

5 (a) Explain with necessary diagram the steps involved in Atmospheric pressure chemical vapour deposition (APCVD) process. **5**

(b) Calculate the deposition rate for a CVD system in which h_G=1cm/sec, K_S=10 cm/sec. partial pressure of incorporating species P_G=1 torr, total pressure P_T = 1 atm = 760 torr. total concentration in gas phase $C_T = 1 \times 10^{19}$ cm^{-3}. **3**

6 (a) State Fick's first law of diffusion and derive the education for Fick's second law of diffusion in one dimension. **5**

(b) Calculate the percentage of molecules that suffer collisions during travel from a source to the substrate in a deposition system at 0.5 Pa and 10^{-4} Pa. The source-to-substrate distance is 40 cm. Assume a typical molecular diameter of 3 A^o. Calculate the result for 27°C temperature. **3**

OR

6 (a) Write the primary applications of metallization in VLSI technology. Also describe the possible metallization choices for integrated circuits. **5**

(b) Design and draw cross-sectional diagram and top view of an integrated NMOS NOT gate. **3**

Use the following data if required. Boltzmann's constant $K_B = 1.38066 \times 10^{-23}$ J/°K.