Name of the Department: PHYSICS DEPARTMENT

Name of the Course: B.Sc. Hons.–CBCS_DSE

Name of the Paper: Physics of Devices and Communications

Semester: V- Semester

Unique Paper Code: 32227505

Question paper Set number: SET C

Total Marks: 75

Attempt four questions out of six. Each question carries equal marks.

1. (a) Discuss the ideal and non-ideal MOS diode using suitable energy band diagram. Draw and discuss the C-V characteristics of MOS diode at high and low frequency. What is Flat-band voltage in SiO_2-Si MOS diode?
   (b) Describe the CMOS using suitable logic circuit.   6.75+5+2+5

2. (a) Explain the working principle of n-channel JFET along with the current-voltage characteristics.
   (b) Consider an n-channel MOSFET based on p-type Si having dopant concentration $N_A = 5 \times 10^{16}$ cm^{-3} and mobility of holes is 200 $cm^2V^{-1}s^{-1}$ at 300K. If the channel conductivity of the MOSFET near Si-SiO_2 interface under the "Strong Inversion condition ($\Psi_S = 2\Psi_B$)" is twice than that obtained under the "Flat Band condition", determine the mobility of electrons in Si. Assume that all acceptor dopants are ionized.
   (c) What is valley point and peak point in UJT?   9.75+5+4

3. Discuss the steps involve in the fabrication process starting from the crystal growth, oxidation, lithography, etching, impurity doping, contacts and metallization using suitable flow diagram.
                18.75

4. (a)Obtain the expression for the transfer function of the first order Butterworth high pass and low pass filter. A band-pass filter has a bandwidth of 250Hz and center frequency of 866 Hz. Find the quality factor of the filter?
   (b) Draw the block diagram and explain the working principle of PLL.   10+3.75+5

5. Explain the bit rate and baud rate with suitable example. What is serial mode of data transmission and discuss its types. Write the examples of serial data transmission standards. Discuss the types and elements of USB transfers.   4+6+3+ 5.75

6. Discuss the need of modulation in communication. Draw the circuit diagram of AM modulator and explain its working. Draw and explain the circuit diagram of demodulation of AM wave using

Diode Detector. Calculate the power developed by AM wave in a load of 200 ohms when the peak voltage of the carrier is 50 V and modulated index is 0.6. 3+7+5+3.75