(a) Name of the Department: PHYSICS DEPARTMENT

(b) Name of the Course: B.Sc. Hons.–CBCS_DSE

(c) Name of the Paper: Physics of Devices and Communications

(d) Semester: V

(e) Unique Paper Code: 32227505

(f) Question paper Set number: SET 2

Total Marks: 75

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

1. Derive the expression of capacitance in terms of voltage for a MOS diode. Draw and explain the I-V characteristics of a UJT. What is valley point and peak point in a UJT and explain their practical importance? 10.25+8.5

2. Draw and explain the small signal equivalent circuit of a JFET. Explain weak inversion condition and strong inversion condition in MOS diode. Derive an expression for maximum width of surface depletion region when the surface is strongly depleted in MOS diode. 7+4+7.75

3. What do you understand by diffusion of an impurity in semiconductors? Write formula for Gaussian profile of diffusion of impurity if impurity is placed on the surface of material and in the bulk of material. Explain terms used in the formula. Explain ion-implantation using a suitable diagram and discuss how a desired impurity profile can be achieved? 2+6+10.75

4. What is a low-pass-filter (LPF)? Compare first order low pass and high pass filter in terms of their frequency response. Derive the expression for the gain of a first order low and high pass filters. In an active LPF, R= 10 kilo-ohm, C=0.01 micro-farad, V_{p-p}= 1 V at the input of filter, gain of amplifier = 10. Calculate the cut-off frequency of the filter. 2+4+8.75+4

5. How is handshaking important for digital data communication? What is the advantage of using parallel communication over serial communication. Explain various lines and signals used in RS232 for serial communication 5+5+8.75

6. Draw and explain the circuit diagram of an emitter modulator for the generation of amplitude modulation. Explain the working of a diode envelope detector. An AM transmitter has carrier power of 30 W. The percentage of modulation is 85 percent. Calculate (a) the total power and (b) the power of one sideband. 7+7.75+4