

B.Sc. (H) Physics / III
Electronic Devices: Physics and Application (Paper XXI)

Time: 3 Hrs.

Max. Marks: 38

Attempt **Five** questions in all.*Question No. 1 is compulsory.* Attempt **One** question from each section

1. Attempt any five: 5x2 = 10
- State the Thevenin network theorem.
 - Explain the differences between photodiode and LED.
 - Explain with the help of circuit diagram the action of a transistor as a switch.
 - Give the advantages of negative feedback in amplifiers.
 - Draw and briefly explain the frequency response of an RC coupled amplifier.
 - Explain the piezoelectric effect.

SECTION A

- State and prove superposition theorem. 3
 - Define the terms Mesh and Node for a circuit. 2
 - Show a four terminal network can be converted into equivalent T and π networks in terms of open circuit and short circuit impedances. 2
3. For an unbiased pn junction, sketch the variation of the space charge, electric field and potential as a function of distance across the junction. Derive the mathematical equations for Barrier potential and Barrier Width. 7

SECTION B

- How does a Half wave rectifier (HWR) work? 2
 - Define ripple factor and efficiency of a rectifier. Derive their expressions for HWR. 5
- Derive a relation between Z and Y parameters of a two port network. 3
 - What is UJT? Draw its structural diagram, its equivalent circuit and characteristic curves. 4

SECTION C

- Draw the circuit of a Class-B push-pull amplifier and describe its operation. Find the expression for the maximum efficiency. 5
 - What is a DC load line and Q-point of an amplifier? And how is the operating point determined? 2
- Explain the need of biasing and stabilization circuits in an amplifier. How can it be achieved best by self bias method? 4
 - A transistor uses self bias method. $R_1 = 50 \text{ k}\Omega$, $R_2 = 10 \text{ k}\Omega$, $R_E = 1 \text{ k}\Omega$. If $V_{CC} = 12 \text{ V}$. Find I_C for $V_{BE} = 0.1 \text{ V}$ 3

SECTION D

- Explain the working of Colpitts Oscillator. Derive the expression of frequency of its oscillations. 5
 - Distinguish between astable and monostable multivibrator. 2
- Explain the CE amplitude modulator circuit. 4
 - Explain the working of the diode detector for demodulation. 3