

Exam. Code : 103206

Subject Code : 1347

B.A./B.Sc. 6th Semester

PHYSICS

Paper—B (Electronics)

Time Allowed—2 Hours] [Maximum Marks—35

Note :— Attempt any **four** questions. All questions carry equal marks.

1. (a) What do you mean by 'Reverse Saturation Current' for a pn junction diode ? How is it affected with rise of temperature ?
- (b) The semiconductor material used to fabricate a photodiode has band gap of 2.48 eV. Can it detect light of wavelength 600 nm ? Explain. Given : $hc = 1240 \text{ eV}\cdot\text{nm}$, where h is Planck's constant and c is the speed of light in vacuum.
- (c) State sign convention followed for currents entering or leaving a transistor.
- (d) Define transconductance of JFET. What is its SI unit ?

- (e) An amplifier with input impedance of $1.0 \text{ K}\Omega$ has voltage gain $A = 100$. A negative feedback with feedback factor $\beta = 0.1$ is given to it. Calculate the input impedance of the feedback amplifier.
- (f) Give any one application of emitter follower.
- (g) What is the role of Radio Frequency Choke (RFC) in Hartley oscillator ?
2. (a) What is a voltage source ? Under what condition, does a practical voltage source approach the behaviour of ideal voltage source ? Draw the symbols of ideal and practical dc voltage sources.
- (b) Explain how depletion region and potential barrier are produced in a pn junction diode. How is the width of depletion region affected when doping level is increased ?
3. (a) Define 'rectification efficiency' of a rectifier. Find the expression for it for a full wave rectifier. What is the possible maximum efficiency for it ?
- (b) What is the role of a filter circuit in a dc power supply ? Discuss qualitatively the working of shunt capacitor filter circuit.

4. Discuss the working of common base npn-transistor in active state. Find the relations among different currents in this transistor. Hence explain its amplifying action.

5. Draw voltage-divider biasing circuit for npn-transistor in CE mode. By assuming that the base current is very small compared to the currents in resistances of voltage-divider arrangement, find the expressions for

(i) Collector current (I_C), and

(ii) Collector-to-emitter voltage (V_{CE}).

Why is this biasing arrangement most preferred ?

6. (a) Define h-parameters for a transistor.

(b) With the help of block diagram of negative feedback amplifier for which there is series-voltage feedback, show that voltage gain of this feedback amplifier is given by

$$A_f = \frac{A}{1 + A\beta}$$

where A is the internal gain of the amplifier and β is the feedback factor.

7. Draw the circuit for Common-source JFET amplifier. With the help of Kirchhoff's rules, draw its ac equivalent circuit. Hence find the expression for its voltage gain.
8. Draw the circuit for tuned-collector transistor oscillator. Explain the roles of different components used and describe its operation. Write down the expression for the frequency produced by this oscillator.