Exam. Code : 103206
Subject Code : 1339

B.A./B.Sc. 6th Semester
PHYSICS
Paper–B (Electronics)

Time Allowed—2 Hours] [Maximum Marks—35

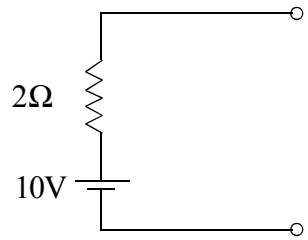
Note :— There are **EIGHT** questions of equal marks. Candidates are required to attempt any **FOUR** questions.

1. (a) What do you mean by

(i) Current source, and

(ii) Voltage source ?

A voltage source is shown in the figure below. Draw its equivalent current source.



(b) Draw the circuit diagram of bridge rectifier and explain its working. Why is it preferred over a centre-tap rectifier ?

2. (a) Define 'ripple factor' for a fluctuating direct current. Find the rms value and dc value for the load current of half-wave rectifier in terms of the peak value of current. Hence show that ripple factor in the load current of this rectifier is 1.21.

   (b) State the principle of pn junction solar cell. Why are Si and GaAs preferred materials for solar cells ?

3. (a) What do you mean by

   (i) active state,

   (ii) saturation state, and

   (iii) cut-off state,

   for a transistor ?

   Which state is used for amplification of input signal ?

   (b) Sketch typical output characteristic curves for npn transistor in CE mode. Explain how output dynamic resistance and ac current gain (β_{ac}) can be determined from these curves.

4. (a) Define the following parameters for JFET :

   (i) dynamic drain resistance (r_d)

   (ii) transconductance (g_m), and

   (iii) amplification factor (μ).

   How are they related ?

   (b) What do you mean by 'Operating point' of a transistor ? Explain why it should be at the middle of output characteristics on the dc load line in the active region. State any two factors which can shift this point.

5. Draw circuit diagram for CE transistor amplifier using voltage-divider biasing arrangement. Under suitable assumptions, draw its h-parameter ac equivalent circuit. Hence derive expressions for (i) current gain, (ii) voltage gain, and (iii) input impedance.

6. (a) Draw the circuit diagram for emitter follower and explain its working. Why is it called so ?

   (b) A feedback to an amplifier changes its voltage gain from 50 to 25.

   (i) Is the feedback negative or positive ?

   (ii) Calculate its feedback factor.

7. (a) How does an LC oscillator differ from a phase shift (RC) oscillator ?

   (b) Draw the circuit of Hartley oscillator using transistor. Explain the role of each component used and describe its operation. Write down the expression for the frequency produced by this oscillator.

8. Draw block diagram for Wien bridge oscillator and explain its working. Find the expression for its frequency. What is the phase difference introduced by the bridge in this oscillator ?