

Roll No.

Total Pages : 03

BT-3/D-19 33005
SEMICONDUCTOR DEVICES AND
CIRCUITS
ECE-201E

Time : Three Hours]

[Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting at least *one* question from each Section.

Section I

1. (a) What are the phenomena that lead to breakdown in a junction diode ? Explain them in detail and give the application of such a diode in breakdown. **10**
(b) What are the possible capacitances associated with a p-n junction diode ? What is the capacitance that is predominant when the diode is reverse biased ? Derive its equation. **10**
2. (a) Draw the circuit diagram of a full-wave rectifier employing bridge connection. Explain its working. Sketch the input and output wave forms. **10**
(b) The output of a Full Wave Rectifier is fed from 40-0-40 V transformer. The load current is 0.1 A. Two 40 mF capacitors are available. $R_L = 50\Omega$:
 - (i) Calculate the value of inductance for a two-stage L-sector filter ripple factor is 0.0001.
 - (ii) Find the output voltage. **10**

(3-27/7) L-33005

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Section II

3. (a) Draw the circuit diagram of Darlington emitter follower and derive the expression for input impedance. **10**
(b) Draw the simplified model of a CC transistor amplifier circuit and derive its parameters. **10**
4. (a) The Reverse saturation current in a *npn* transistor in CB circuit is 12.5 mA. For an $I_E = 2$ mA, $I_C = 1.97$ mA. determine the circuit gain and base current. **10**
(b) State the linear analysis of a transistor amplifier circuit. State the Miller's theorem and its dual and give its applications. **10**

Section III

5. (a) Draw the circuit diagram of a RC phase-shift oscillator employing FET and derive the equation for the frequency of oscillation and condition of oscillation. **10**
(b) State and explain the Barkhausen criterion for oscillations in a sinusoidal oscillator with feedback network. **10**

L-33005

2

6. (a) Draw the circuit of a Wein bridge oscillator using Op-Amp. Derive an equation for the condition of oscillation of a Wein bridge oscillator. **10**
- (b) Discuss at length the frequency stability of sinusoidal oscillators. A crystal oscillator has the highest frequency stability. Justify. **10**

Section IV

7. (a) Describe the construction and principle of operation of a JFET with the help of its output and transfer characteristics. **10**
- (b) Draw the small signal equivalent circuit for a JFET and derive the equation for voltage amplification. **10**
8. (a) Draw the drain characteristics of a common source JFET and label different regions. Explain the reasons for its shape. Obtain all the parameters of JFET from drain characteristics. **10**
- (b) With a neat construction diagram, explain the operation of enhancement and depletion MOSFET. **10**