

B.E./B.TECH. Degree Examination, December 2020

Second Semester

EC16201 - ELECTRONIC DEVICES

(Regulation 2016)

Time: Three hours

Maximum : 80 Marks

Answer **ALL** questions**PART A - (8 X 2 = 16 marks)**

1. If the voltage of the potential barrier is V_0 . A voltage V is applied to the input, at what moment will the barrier disappear?
(a) $V < V_0$ (b) $V = V_0$ (c) $V > V_0$ (d) $V \ll V_0$
2. Transistor works as an open switch when emitter junction is _____ biased and collector junction is _____ biased.
(a) forward, forward (b) reverse, reverse (c) reverse, forward (d) forward, reverse
3. Consider an ideal MOSFET. If $V_{gs} = 0V$, then $I_d = ?$
(a) Zero (b) Maximum (c) $I_{d(on)}$ (d) I_{dd}
4. The device that does not have the gate terminal is _____
(a) FET (b) Triac (c) SCR (d) Diac
5. What is the effect of temperature on PN Junction diode?
6. What is the need for biasing in the transistor?
7. In which region JFET acts as a resistor and why?
8. Differentiate the space charge region in Schottky barrier diode and PN junction diode.

PART B - (4 X 16 = 64 marks)

9. (a) (i) From the basic concepts, derive an expression for the current through a PN Junction diode. **(12)**
(ii) Calculate the built in potential barrier in a PN junction. Consider a silicon PN junction at 300K with doping densities $N_a = 1 \times 10^{18} \text{ cm}^{-3}$ and $N_d = 1 \times 10^{15} \text{ cm}^{-3}$. Assume $n_i = 1.5 \times 10^{10} \text{ cm}^{-3}$. **(4)**
- (OR)**
- (b) (i) Derive the expression for drift current density and diffusion current density in a semiconductor. **(8)**
(ii) Enumerate the switching characteristics of the PN diode with suitable circuit and waveforms. **(8)**
10. (a) Analyze the input and output characteristics of CE configuration of NPN transistor and also find the h-parameters. **(16)**

(OR)

- (b) (i) Design and analyze a PNP bipolar junction transistor using Ebers-Moll model. **(12)**
(ii) The transistor has $I_E = 10$ mA and $\alpha = 0.98$. Find the value of base and collector currents. **(4)**
11. (a) (i) Construct and demonstrate the working mechanism of N-Channel JFET and also discuss its drain and transfer characteristics. **(12)**
(ii) When the reverse gate voltage of JFET changes from 4 to 3.9 V, the drain current changes from 1.3 to 1.6 mA? Find the value of transconductance. **(4)**

(OR)

- (b) (i) Enumerate the structure of a SCR with a two transistor model and derive an expression for anode current (I_A). Also draw its V-I characteristics. **(16)**
12. (a) (i) Show how the capacitance of the Varicap varies inversely with reverse bias voltage. **(8)**
(ii) Explain the principle behind the injection laser with a neat sketch and list out its applications. **(8)**

(OR)

- (b) Draw and explain the Energy Band diagram of Esaki diode at 0 K, under no bias, forward bias and reverse bias. Also illustrate the V-I characteristics and the negative resistance phenomenon. **(16)**