Course Code: 20EC0445 **R20**

SIDDHARTH INSTITUTE OF ENGINEERING &TECHNOLOGY::PUTTUR-517583
(Autonomous)
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code: BASIC ELECTRONICS ENGINEERING (20EC0445)
Course & Branch: B. Tech & CSE,CSM, CAD,CAI,CCC,CSIT,CIC
Year & Sem: I-B.Tech & I-Sem
Regulation: R20

UNIT-I
Basics of Semiconductor

1.	a)	Explain the following terms: Conductors Insulators Semiconductors and give an example for each.	[L2][CO1]	**[8M]**
	b)	Explain the crystal structure of silicon with a neat sketch.	[L2][CO1]	**[4M]**
2.	a)	Explain the 2-D representation of the Germanium crystal structure with neat a sketch.	[L2][CO1]	**[4M]**
	b)	Describe the energy band diagrams.	[L2][CO1]	**[8M]**
3.	a)	Differentiate between the valence band and conduction band in detail.	[L2][CO1]	**[4M]**
	b)	Distinguish between conductors, semiconductors and insulators.	[L2][CO1]	**[8M]**
4.	a)	Differentiate between the forbidden energy gap and Fermi level in the valence band and conduction band.	[L2][CO1]	**[6M]**
	b)	Compare and contrast the electrical properties of Silicon and Germanium.	[L2][CO1]	**[6M]**
5.	a)	Distinguish between intrinsic and extrinsic semiconductors and explain the process of conduction in each of them.	[L2][CO1]	**[8M]**
	b)	Give examples of donor and acceptor impurities.	[L2][CO1]	**[4M]**
6.	a)	Draw the atomic structure of a semiconductor and explain why an Intrinsic semiconductor is relatively a poor conductor of electricity.	[L1][CO1]	**[6M]**
	b)	What is meant by doping in semiconductors? What is the need for doping?	[L1][CO1]	**[6M]**
7.	a)	Discuss the conduction properties of semiconductors and explain the process of electron-hole pair generation and recombination.	[L2][CO1]	**[8M]**
	b)	Intrinsic materials are not widely used, Explain the reasons?	[L2][CO1]	**[4M]**
8.	a)	List the advantages of n-type over p-type semiconductors.	[L1][CO1]	**[4M]**
	b)	Compare p-type and n-type semiconductors.	[L2][CO1]	**[8M]**
9.	a)	Explain drift current with expressions.	[L2][CO1]	**[6M]**
	b)	Explain diffusion current with expressions.	[L2][CO1]	**[6M]**
10.	a)	Explain in detail about mass action law.	[L2][CO1]	**[4M]**
	b)	Describe the charge neutrality in semiconductors in detail.	[L2][CO1]	**[8M]**

Course Code: 20EC0445 **R20**

UNIT –II
PN JUNCTION DIODE

1.	a)	Define PN Junction and Explain how Depletion layer is formed in open circuited PN junction diode.	[L2][CO1]	**[6M]**
	b)	Define and discuss the barrier potential of a PN junction diode with a neat sketch.	[L2][CO1]	**[6M]**
2.	a)	Illustrate the action of PN junction diode under forward bias and reverse bias and sketch its V-I Characteristics.	[L3][CO1]	**[6M]**
	b)	Draw the ideal diode characteristics of PN junction diode and its electrical equivalent model.	[L1][CO1]	**[6M]**
3.	a)	A PN junction diode has a reverse saturation current of 30 μA at a temperature of 125^0 C. At the same temperature calculate the dynamic resistance for 0.2 V bias in forward and reverse direction.	[L3][CO4]	**[4M]**
	b)	Analyze the current components in a PN diode and derive the expression for diode current.	[L4][CO1]	**[8M]**
4.	a)	When a reverse bias is applied to a germanium PN junction diode, the reverse saturation current at room temperature is 0.3μA. Determine the current flowing in the diode when 0.15V forward bias is applied at room temperature.	[L3][CO4]	**[4M]**
	b)	Demonstrate the temperature dependence of the V-I characteristics of PN junction diode.	[L2][CO1]	**[8M]**
5.	a)	The reverse saturation current of a silicon PN junction diode is 10μA. Calculate the diode current for the forward bias voltage of 0.6V at 25^0C.	[L3][CO1]	**[4M]**
	b)	Discuss the Diode Resistances.	[L2][CO1]	**[8M]**
6.	a)	Calculate the forward resistance of a PN junction diode when the forward current is 5mA at T = 300 K. Assume Silicon diode.	[L3][CO1]	**[6M]**
	b)	Define Transition and Diffusion capacitances of a PN junction Diode.	[L1][CO1]	**[6M]**
7.	a)	Describe Transition and Diffusion capacitances of a PN junction Diode with expressions.	[L5][CO1]	**[6M]**
	b)	Discuss about Breakdown mechanisms in PN Junction Diode.	[L2][CO1]	**[6M]**
8.	a)	Distinguish between PN junction diode and Zener diode.	[L1][CO1]	**[6M]**
	b)	The reverse saturation current of a Germanium PN junction diode is 8μA. Find the diode current for the forward bias voltage of 0.3V at 27^0C.	[L3][CO2]	**[6M]**
9.	a)	List the applications of PN junction diode and Zener diode.	[L1][CO1]	**[6M]**
	b)	Define Breakdown voltage and draw the symbol of Zener Diode.	[L1][CO1]	**[6M]**
10.	a)	Draw and explain the V-I characteristics of Zener diode.	[L1][CO1]	**[4M]**
	b)	Explain the Zener voltage regulator with a neat diagram.	[L2][CO2]	**[4M]**
	c)	Design and draw a Zener regulator circuit to meet the following specifications. Load voltage= 8V, Input voltage= 30V, Load current= 0-50 mA, Izmin= 5mA, Pz= 1 W.	[L3][CO3]	**[4M]**

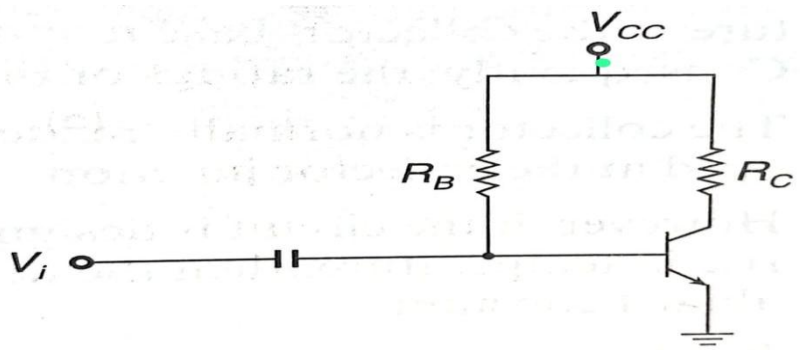
Course Code: 20EC0445 **R20**

UNIT –III
RECTIFIERS

1.	a)	i) Define Rectifier and classify them.	[L2][CO1]	**[2M]**
		ii) Draw the circuit diagram of a half wave rectifier and explain its operation.	[L1][CO1]	**[4M]**
	b)	Derive the expressions for Average DC current, Average DC Voltage, RMS Value of Current, DC Power Output, AC Power input and Efficiency of a Half Wave Rectifier.	[L3][CO2]	**[6M]**
2.	a)	A half wave rectifier, having a resistive load of 1000Ω, rectifies an alternating voltage of 325V peak value and the diode has a forward resistance of 100Ω. Calculate (a)peak, average and rms value of current (b) dc power output (c) ac input power, and (d) efficiency of the rectifier.	[L4][CO2]	**[6M]**
	b)	A voltage of 200cosωt is applied to Half Wave Rectifier with load resistance of 5 kohm, find the maximum dc current, rms current and ripple factor	[L3][CO2]	**[6M]**
3.	a)	Draw the circuit diagram of a Full wave rectifier and with the help of waveforms describe its operation.	[L1][CO1]	**[6M]**
	b)	Derive the expressions for Average DC current, Average DC Voltage, RMS Value of Current, DC Power Output, AC Power input and Efficiency of a Full Wave Rectifier.	[L3][CO2]	**[6M]**
4.	a)	In a full wave rectifier, the transformer rms secondary voltage from center tap to each end of the secondary is 50V.The load resistance is 900Ω. If the diode resistance and transformer secondary winding resistance together has a resistance of 100Ω, determine the average load current and rms value of load current.	[L3][CO2]	**[8M]**
	b)	Compare the Full wave and Half wave rectifiers.	[L2][CO1]	**[4M]**
5.	a)	Determine the ripple factor for both half wave and full wave rectifier.	[L3][CO2]	**[6M]**
	b)	List the advantages of full wave rectifier over the half wave rectifier.	[L1][CO1]	**[6M]**
6.	a)	Define Filter and discuss various types of filters.	[L2][CO1]	**[4M]**
	b)	Draw the circuit diagram of Full wave rectifier with inductor filter and explain its operation. Also derive the expression for ripple factor.	[L3][CO2]	**[8M]**
7.	a)	Find the value of inductance to be used in the inductor filter connected to a full wave rectifier operating at 60 Hz to provide a dc output with 4% ripple for a 100Ω load.	[L3][CO5]	**[4M]**
	b)	With neat circuit diagram and waveforms, Explain the operation of Full wave rectifier with capacitor Filter and derive the expression for its ripple factor.	[L3][CO2]	**[8M]**
8.	a)	Determine the value of capacitance to be used in a capacitor filter connected to a full wave rectifier operating at a standard aircraft power frequency of 400 Hz, if the ripple factor is 10% for a load of 500Ω.	[L3][CO5]	**[4M]**
	b)	Explain the working principle of rectifiers with and without capacitors.	[L2][CO1]	**[8M]**
9.	a)	Demonstrate the working principle of LC filter with neat diagram and derive the expression for its ripple factor.	[L3][CO2]	**[8M]**
	b)	Design a filter for full wave circuit with LC filter provides an output voltage of 10V with a load current of 200mA and the ripple is limited to 2%.	[L3][CO4]	**[4M]**
10.	a)	Explain the construction and working principle of CLC or π section filter along with derivation for its ripple factor.	[L3][CO2]	**[8M]**
	b)	Compare various types of filters.	[L2][CO1]	**[4M]**

Course Code: 20EC0445 **R20**

UNIT –IV
BIPOLAR JUNCTION TRANSISTOR (BJT)

1.	a)	i) Describe the construction of BJT, List different types of BJTs and draw the symbols.	[L1][CO1]	**[2M]**
		ii) Discuss the operation of NPN transistor with neat diagram.	[L2][CO1]	**[6M]**
	b)	If the base current in a transistor is 20μA when the emitter current is 6.4mA What are the values of α and β? Also calculate the collector current.	[L3][CO4]	**[4M]**
2.	a)	Explain the current components of PNP transistor.	[L2][CO2]	**[6M]**
	b)	Draw the Input and Output characteristics of a BJT in CB Configuration.	[L1][CO1]	**[6M]**
3.	a)	Explain the Input and Output characteristics of a BJT in CE Configuration.	[L2][CO1]	**[6M]**
	b)	For a transistor, the leakage current is 0.1μA in CB configuration, While it in CE configuration. Calculate α & β of the same transistor?	[L3][CO2]	**[6M]**
4.	a)	Explain the Input and Output characteristics of a BJT in CC Configuration.	[L2][CO1]	**[6M]**
	b)	Derive the relation between α, β and ϒ of a Transistor.	[L3][CO2]	**[6M]**
5.	a)	Compare the configuration of CE,CB and CC.	[L2][CO1]	**[6M]**
	b)	With a neat diagram, Explain how a transistor acts as an amplifier?	[L2][CO2]	**[6M]**
6.	a)	Define Transistor Biasing and explain the need for Biasing.	[L2][CO2]	**[8M]**
	b)	List the different types of Biasing.	[L1][CO1]	**[4M]**
7.	a)	Explain the concept of DC and AC Load lines and discuss the criteria for Fixing the Q-point.	[L2][CO2]	**[6M]**
	b)	Define Stability Factor S. Derive the expressions for the stability factors S S'' of a BJT bias.	[L1][CO2]	**[6M]**
8.	a)	Discuss about the different types of biasing	[L2][CO2]	**[6M]**
	b)	Explain the operation of self-bias circuit of BJT and its advantages.	[L2][CO2]	**[6M]**
9.	a)	Design the circuit shown in figure given Q-point values are to be I_{CQ} =1mA and V_{CEQ} = 6V. Assume that V_{CC} = 10V, β= 100, V_{BEsat} = 0.7 V. 	[L4][CO6]	**[6M]**
	b)	Interpret Diode Compensation Technique for the parameters V_{BE} and $I_{CO.}$	[L3][CO2]	**[6M]**
10.	a)	Illustrate Thermistor Compensation Technique.	[L3][CO1]	**[6M]**
	b)	Discuss about Sensistor Compensation Technique.	[L2][CO1]	**[6M]**

Course Code: 20EC0445 **R20**

UNIT –V
FIELD EFFECT TRANSISTOR (FET)

1.	a)	Classify the types of JFET and Draw its symbols.	[L2][CO1]	**[4M]**
	b)	Explain the construction and working principle of N-channel JFET.	[L2][CO1]	**[8M]**
2.	a)	Sketch the drain characteristics N-channel JFET.	[L3][CO1]	**[6M]**
	b)	Explain the different regions of operation of N-Channel JFET.	[L2][CO1]	**[6M]**
3.	a)	Explain the construction and working principle of P-channel JFET.	[L3][CO1]	**[6M]**
	b)	Sketch the transfer characteristics of N-channel JFET and explain.	[L2][CO1]	**[6M]**
4.	a)	List the differences between N-channel JFET and P-channel JFET.	[L2][CO1]	**[6M]**
	b)	Sketch the transfer characteristics of P-channel JFET.	[L2][CO1]	**[6M]**
5.	a)	Derive the Drain to Source resistance, Trans-conductance and amplification factor from Characteristics of JFET.	[L4][CO2]	**[8M]**
	b)	Classify types of MOSFET and Draw their symbols.	[L2][CO1]	**[4M]**
6.	a)	List the differences between depletion and enhancement MOSFET.	[L1][CO1]	**[4M]**
	b)	With the help of neat diagram, Explain the operation and characteristics of N-channel Depletion type MOSFET under Depletion mode.	[L2][CO1]	**[8M]**
7.	a)	With the help of neat diagram, explain the operation of N-channel Depletion type MOSFET under Enhancement mode.	[L2][CO1]	**[6M]**
	b)	Explain the characteristics of N-channel Depletion type MOSFET under Enhancement mode.	[L2][CO1]	**[6M]**
8.	a)	Explain construction and working principle of E-only MOSFET.	[L2][CO1]	**[8M]**
	b)	Sketch the transfer and drain characteristics of E-only MOSFET.	[L2][CO1]	**[4M]**
9.	a)	Compare the performance of BJT with JFET.	[L2][CO1]	**[6M]**
	b)	List the types of JFET Biasing and Explain Briefly the setting of Operating Point.	[L1][CO6]	**[6M]**
10.	a)	Explain voltage divider bias of JFET with neat circuit diagram.	[L4][CO6]	**[8M]**
	b)	Discuss the merits of the voltage divider bias	[L2][CO1]	**[4M]**

Prepared By: ECE Faculty - SIETK