Course Code: 20EC0445 **R20**

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
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QUESTION BANK (DESCRIPTIVE)

Subject with Code: Basic Electronics Engineering (20EC0445)
Year & Sem: I-B.Tech & I-Sem

Course & Branch: B.Tech – CSE, CSIT, CSM & CIC
Regulation: R20

UNIT –I
Basics of Semiconductor

1	**a**	Distinguish among conductors, semiconductors and insulators.	**[L4][CO1] [8M]**
	b	What is meant by Doping in a semiconductor? And list the different types of acceptor and donor impurities.	**[L1][CO1] [4M]**
2	**a**	Explain the differences between intrinsic and extrinsic semiconductors.	**[L2][CO1] [8M]**
	b	Define the terms Drift and Diffusion current.	**[L1][CO1] [4M]**
3	**a**	With the help of Energy band diagram define the following terms: i) valence band, ii) conduction band, and iii) band gap	**[L1][CO1] [8M]**
	b	Compare and contrast the semiconductors Silicon and Germanium.	**[L4][CO1] [4M]**
4	With the help of Energy band diagrams explain Conductors, Semiconductors & Insulators.		**[L2][CO1] [12M]**
5	**a**	Explain the differences between P-type and N-type semiconductors.	**[L2][CO1] [6M]**
	b	State and explain the term Conductivity in conductors and in semiconductors.	**[L2][CO1] [6M]**
6	Describe the operation of Intrinsic semiconductor at T=0 Kevin and T=300 Kelvin.		**[L2][CO1] [12M]**
7	**a**	What is meant by Accepter energy level?	**[L2][CO1] [3M]**
	b	State and Explain the law of electrical neutrality in semiconductor.	**[L2][CO1] [9M]**
8	Describe the operation of P-type semiconductor at T=0 Kevin and T=300 Kelvin.		**[L2][CO1] [12M]**
9	**a**	What is meant by Donor energy level?	**[L2][CO1] [3M]**
	b	Explain in detail about mass action law.	**[L2][CO1] [9M]**
10	Describe the operation of N-type semiconductor at T=0 Kevin and T=300 Kelvin.		**[L2][CO1] [12M]**

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UNIT –II
PN JUNCTION DIODE

1	**a**	Explain how a barrier potential is developed at the PN junction.	**[L2][CO1] [10M]**
	b	Mention the applications of PN diode.	**[L1][CO1] [2M]**
2		With the help of V-I Characteristics explain the action of PN junction diode under forward and reverse bias condition.	**[L2][CO1] [12M]**
3	**a**	Distinguish between Avalanche and Zener breakdown.	**[L2][CO1] [6M]**
	b	Plot the graph for different breakdown mechanisms in semiconductors.	**[L2][CO1] [6M]**
4		Explain the terms i) Transition capacitance C_T of a PN diode. ii) Diffusion capacitance C_D of a PN diode	**[L3][CO1] [12M]**
5	**a**	Explain Quantitative Theory of PN Diode Currents.	**[L2][CO1] [8M]**
	b	A p-n junction germanium diode has a reverse saturation current of 0.10 µA at the room temperature of 27^0C. It is observed to be 30µA, when the room temperature is increased. Calculate the new room temperature. Also determine the current passing through the diode at this new temperature.	**[L3][CO1] [4M]**
6	**a**	Draw the V-I characteristics of Zener diode and explain its operation.	**[L4][CO1] [10M]**
	b	Mention the applications of Zener diode.	**[L3][CO1] [2M]**
7		Explain the terms w.r.t PN diode. i) Static Resistance ii) Dynamic Resistance and iii) Reverse Resistance.	**[L2][CO1] [12M]**
8	**a**	Explain the effect of temperature on the Diode characteristics.	**[L2][CO1] [8M]**
	b	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][CO1] [4M]**
9	**a**	Compare and contrast PN diode with Zener diode.	**[L2][CO1] [6M]**
	b	The reverse saturation current of a silicon PN junction diode is 10µA. Solve the diode current for the forward bias voltage of 0.6V at 25^0c.	**[L2][CO4] [6M]**
10		Explain how the zener diode can be used as a voltage regulator.	**[L3][CO1] [12M]**

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UNIT –III
RECTIFIERS

1	**a**	What is rectifier? Classify the different types of Rectifiers.	**[L2][CO1][3M]**
	b	Define and formulate the following terms **i)** Ripple Factor **ii)** efficiency and **iii)** PIV	**[L1][CO1][9M]**
2	**a**	Draw the circuit diagram of HWR and explain its operation with the help of waveforms.	**[L3][CO1][6M]**
	b	Derive the expressions for Ripple factor, PIV and efficiency for HWR.	**[L2][CO1][6M]**
3	**a**	Draw the circuit diagram of FWR and explain its operation with the help of waveforms.	**[L2][CO1][6M]**
	b	Derive the expressions for Ripple factor, PIV and efficiency for FWR.	**[L2][CO1][6M]**
4		A HWR uses a diode with 50Ω internal resistance, if RMS input is 110V and R_L=1000Ω then calculate: i) Peak output current ii) DC output current iii) RMS output current iv) Efficiency.	**[L3][CO2][12M]**
5	**a**	What is Filter? Classify different types of Filters.	**[L2][CO1][3M]**
	b	Demonstrate the working principle of LC filter with neat diagram and derive the expression for its ripple factor.	**[L2][CO1][9M]**
6	**a**	Compare the performance of various types of filters.	**[L2][CO1][6M]**
	b	Draw the circuit diagram for CLC or π filter and state its ripple factor.	**[L1][CO1][6M]**
7	**a**	Obtain the ripple factor of a FWR with shunt capacitor filter.	**[L4][CO1][6M]**
	b	Derive an expression for the ripple factor in a FWR using inductor filter.	**[L4][CO1][6M]**
8	**a**	Describe the operation of shunt capacitor filter with the help of circuit diagram and waveforms.	**[L2][CO1][6M]**
	b	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.	**[L1][CO2][6M]**
9	**a**	Describe the operation of inductor filter with the help of circuit diagram and waveforms.	**[L2][CO1][6M]**
	b	Inspect 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.	**[L4][CO2][6M]**
10	**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 (i)peak, average and rms value of current (ii) d.c. power output (iii) ac input power ,and (iv) efficiency of the rectifier.	**[L4][CO2][6M]**
	b	Compare full wave rectifier with half-wave rectifier.	**[L5][CO1][6M]**

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UNIT –IV
BIPOLAR JUNCTION TRANSISTOR (BJT)

1	**a**	What is a BJT and its symbols? Explain the construction of NPN and PNP transistors.	**[L1][CO1][6M]**
	b	Explain the operation of NPN transistor under active region.	**[L2][CO1][6M]**
2	**a**	Compare the performance of a transistor in different configurations.	**[L2][CO2][6M]**
	b	Derive the relationship between α and β.	**[L4][CO2] 6M]**
3	**a**	Briefly explain the different configurations in BJT.	**[L2][CO1] 6M]**
	b	With a neat diagram, explain how a transistor acts as an amplifier.	**[L2][CO3] 6M]**
4	**a**	Explain the Input and Output characteristics of a BJT in CB Configuration.	**[L2][CO3] 8M]**
	b	If a transistor has α of 0.97, find the value of β. If β=200, find the value of α.	**[L1][CO2] 4M]**
5	**a**	Explain the Input and Output characteristics of a BJT in CE Configuration.	**[L2][CO1] 8M]**
	b	For a transistor, the leakage current is 0.1μA in CB configuration, while it is 19μA in CE configuration. Find α & β of the same transistor?	**[L1][CO4] 4M]**
6	**a**	Explain the Input and Output characteristics of a BJT in CC Configuration.	**[L2][CO1] 8M]**
	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.	**[L1][CO2] 4M]**
7	**a**	What is current amplification factor in CB, CE and CC configurations?	**[L1][CO1] 6M]**
	b	Derive the relation among α, β and γ.	**[L6][CO1][6M]**
8	**a**	Define Transistor Biasing. Explain the need for Biasing and their types.	**[L1][CO2] 6M]**
	b	Draw and explain the circuit for voltage divider bias for establishing a stable operating point.	**[L4][CO2] 6M]**
9	**a**	Define Stability Factor S, Stability Factor S′ and Stability Factor S″	**[L2][CO1][6M]**
	b	Derive the relation among I_C, I_B and I_{CBO}.	**[L4][CO2][6M]**
10	**a**	Explain the concept of DC and AC Load lines and discuss the criteria for fixing the Q-point.	**[L2][CO2] 6M]**
	b	Draw a circuit which uses a diode to compensate for changes in I_{CO}. Explain how stabilization is achieved in the circuit.	**[L2][CO2][6M]**

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UNIT –V
FIELD EFFECT TRANSISTOR (FET)

1	**a**	What is a JFET and its types & symbols?	**[L1][CO1] [4M]**
	b	Explain the construction and working principle of N-channel JFET.	**[L2][CO1] [8M]**
2	**a**	Sketch and explain the n-channel JFET output characteristics under applied bias.	**[L2][CO1] [8M]**
	b	Classify the types of MOSFETS with their symbols.	**[L2][CO1] [4M]**
3	**a**	List the differences between n-channel JFET and p-channel JFET.	**[L4][CO1][6M]**
	b	Briefly explain the term pinch-off voltage using drain characteristics of JFET.	**[L2][CO2] [6M]**
4	**a**	Compare the performance of BJT with FET.	**[L2][CO1] [8M]**
	b	List the applications of MOSFETs.	**[L4][CO1] [4M]**
5	**a**	Sketch the transfer characteristics of n-channel JFET and explain.	**[L2][CO1] [8M]**
	b	Compare the performance of MOSFET with FET.	**[L2][CO1][4M]**
6		Define the following FET parameters: i) Drain Resistance ii) Trans-conductance iii) Amplification factor	**[L1][CO1] [12M]**
7		With the help of neat diagram, explain the operation and characteristics of N-channel Depletion type MOSFET.	**[L2][CO2] [12M]**
8		With the help of neat diagram, explain the operation and characteristics of n-channel Enhancement type MOSFET.	**[L2][CO2] [12M]**
9	**a**	List differences between depletion and enhancement MOSFET.	**[L4][CO1] [6M]**
	b	Explain the voltage divider bias circuit of FET.	**[L2][CO3] [6M]**
10	**a**	List the types of biasing in FET.	**[L4][CO3] [4M]**
	b	Explain the different methods for fixing the Q-point in a FET.	**[L2][CO4] [8M]**