II B. Tech I Semester Regular Examinations, Feb/March - 2022
ELECTRONIC DEVICES AND CIRCUITS
(Electrical and Electronics Engineering)

Time: 3 hours   Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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1	a)	With necessary equations derive charge densities in a semiconductor material.	[7M]
	b)	The current flow through a PN-junction diode is 0.8 mA at forward-biased voltage 300 mV and 20 mA at forward-biased voltage 400 mV. Determine the value of η if the junction operates at 295K.	[7M]

Or

2	a)	Find the conductivity of silicon atom when the donor impurities of 1 in 10^8 is applied. The intrinsic value of silicon atom is 1.5×10^{10} cm^{-3} at 300^0K. The mobility of the electrons and holes are 1200 cm^2 /V-s and 600 cm^2 /V-s respectively. The number of silicon atoms is 5×10^{25} cm^{-3}.	[6M]
	b)	Discuss in brief about the current components in PN junction diode.	[8M]

3	a)	Explain the breakdown mechanisms in semiconductor diodes.	[6M]
	b)	Draw the symbol of Tunnel diode. Explain the construction and tunneling phenomenon of Tunnel diode.	[8M]

Or

4	a)	A centre-tapped single-phase full-wave rectifier has two diodes and the forward resistance of each diode is 20 ohms. The transformer secondary voltage from centre to each half of the secondary winding is $25\sqrt{2} \sin \omega t$ and the load resistance is 3000 ohms. Determine (i) the average value of load current, and (ii) the peak inverse voltage of each diode.	[6M]
	b)	Sketch the circuit of a bridge rectifier and explain its operation.	[8M]

5	a)	Draw and explain the input and output characteristics of BJT in common base configuration.	[8M]
	b)	Calculate the α_{dc} and β_{dc} for the given transistor for which I_C=6mA, I_B=50μA and I_{CO} = 1μA.	[6M]

Or

6	a)	Explain the Construction and working of n-channel JFET with neat sketches. Discuss its drain and transfer characteristics?	[10M]
	b)	Give the comparison between JFET and MOSFET.	[4M]

7	a)	Explain the operation of collector to base bias.	[6M]
	b)	What is thermal runaway in transistors? Obtain the condition for thermal stability in transistors.	[8M]

Or

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8   a)   Explain about stabilization against variations in V_{BE}, I_C and β.   [7M]

     b)   Design a voltage divider bias circuit for specified condition $V_{CC} = 12V$, $V_{CE} = 6V$, $I_C = 1$ mA, S = 20, $\beta = 100$ and $V_E = 1V$.   [7M]

9   Derive the expressions for current gain, voltage gain, input impedance and output impedance of CB amplifier using h-parameter model.   [14M]

Or

10 a)   Obtain CB parameters in terms of CE parameters.   [10M]

     b)   Draw the small signal model of an FET and explain the significance of each element.   [4M]

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