Code No: R1921041 $\quad$ **R19** $\quad$ SET - 1

II B. Tech I Semester Regular Examinations, March - 2021
ELECTRONIC DIVICES AND CIRCUITS
(Electronics and Communication Engineering)

Time: 3 hours $\hfill$ Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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1	a)	What is Hall effect? Derive the relation between mobility and hall coefficient?	[8M]
	b)	Define a hole in a semiconductor? Indicate how a hole contributes to conduction pictorially?	[7M]

Or

2	a)	Draw the band diagram of p-n junction diode? Define law of junction?	[8M]
	b)	How many types of junction capacitances are there? Explain with neat diagrams?	[7M]
3	a)	Explain the two transistor analogy of an SCR. Draw the V-I characteristics of SCR?	[8M]
	b)	What are the various filter circuits used in rectifiers. Compare their performance.	[7M]

Or

4	a)	Derive the expressions for PIV, Ripple factor, Conversion Efficiency and TUF of a Full wave rectifier.	[8M]
	b)	What is UJT and draw the Construction, operation of a UJT along with its characteristics?	[7M]
5	a)	Sketch a family of CE input and output characteristics for a transistor? Indicate the cutoff, active and saturation regions?	[8M]
	b)	With the help of suitable diagrams, explain the working of n-channel enhancement MOSFET?	[7M]

Or

6	a)	Tabulate comparisons of CB, CE and CC configurations with examples.	[8M]
	b)	An n-channel JFET has I_{DSS} =10mA and V_P = - 2V. Determine the drain source resistance r_{DS} for (i) V_{GS} =0V. (ii) V_{GS} = - 0.5V	[7M]
7	a)	Define the stability factors S, S' and S'' and derive the relation between them.	[8M]
	b)	Define Thermal runaway. Derive the necessary condition to avoid thermal runaway in a transistor?	[7M]

Or

8	a)	Explain the necessity of biasing a Transistor. Derive the Q-point of a self-bias circuit.	[8M]
	b)	Explain the stabilization of Q-point using sensistor and thermistor.	[7M]
9	a)	Derive simplified h parameter model of a transistor. State its advantages. Derive an expression for voltage gain of CE, CB and CC amplifiers using simplified h parameter model.	[8M]
	b)	Describe the operation of common drain FET amplifier and derive the equation for voltage gain.	[7M]

Or

10	a)	Draw the equivalent circuit of common source FET amplifier and derive the expression for voltage gain.	[8M]
	b)	Draw low frequency model of FET and list out advantages over BJT.	[7M]

Code No: R1921041   **R19**   SET - 2

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Time: 3 hours   Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
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1 a) Derive the condition of dynamic equilibrium for the density of charge carries for continuity equation? [8M]
   b) Give the mathematical analysis and show that the Fermi energy level lies in the centre of forbidden energy band for an intrinsic semiconductor. [7M]

Or

2 a) Sketch neat diagram of I-V characteristics of p-n junction diode, and explain? Give the relation between current I and voltage V? [8M]
   b) For a Ge diode, the $I0=2\mu A$ and the voltage of 0.26V is applied. Calculate the forward and reverse dynamic resistance values at room temperature. [7M]

3 a) Define and derive the terms as referred to HWR circuit.   i) PIV   ii) Average d.c. voltage   iii) RMS current   iv) Ripple factor. [8M]
   b) Explain the significance of Rectifiers with filters, and what are the advantages of capacitor filter over Inductor filter? [7M]

Or

4 a) Explain the Zener and Avalanche thermal breakdown mechanisms. What will be their thermal coefficients? [8M]
   b) Explain the principle and operation of tunnel diode with energy band diagrams? [7M]

5 a) Briefly discuss about the construction, working and static drain characteristics of enhancement MOSFET? [8M]
   b) Tabulate the comparisons between JFET and MOSFET? [7M]

Or

6 a) With suitable diagrams explain the input and output characteristics of a Common Emitter Configuration. [8M]
   b) Explain the operation of a Field effect Transistor. Derive an expression for pinch-off voltage of a FET. [7M]

7 a) Draw and explain the Fixed Bias Circuit. Explain why the circuit is unsatisfactory if the transistor is replaced by another of same type. [8M]
   b) Discuss clearly the diode and sensistor compensation techniques. [7M]

Or

8 a) What is the necessity of biasing circuits? Derive the expression for stability factor of self bias circuit. [8M]
   b) In a Silicon transistor circuit with a fixed bias, $V_{CC}=9V$, $R_C=3K\Omega$, $R_B=8K\Omega$, $\beta = 50$, $V_{BE}=0.7V$. Find the operating point and Stability factor. [7M]

9 a) Briefly explain about the JFET Small signal Model with the help of neat diagrams. [8M]
   b) Analyze Common Emitter amplifier with Re circuit using h-parameter model. [7M]

Or

10 a) Draw the exact h parameter model of a Transistor suitable for any configuration. [8M]
        Derive expressions for voltage gain, current gain, input impedance and output
        impedance of an amplifier using exact h parameter model?

    b) Derive an expression for voltage gain of a Common Drain Amplifier.   [7M]

Code No: R1921041   (**R19**)   (SET - 3)

II B. Tech I Semester Regular Examinations, March - 2021
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Time: 3 hours   Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
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1	a)	Explain the classification of Insulators, Semi conductors, and Metals using Energy Band Diagrams?	[8M]
	b)	Sketch the piecewise linear characteristics of a diode. What are the approximate cut-in voltages for silicon and germanium?	[7M]

Or

2	a)	What do you mean by step graded junction? Derive the expression for diffusion capacitance.	[8M]
	b)	Explain the temperature dependent characteristics of PN junction diode?	[7M]
3	a)	Explain the operation of Full Wave Rectifier with Induction filter with necessary diagrams.	[8M]
	b)	A sinusoidal voltage whose V_m=26V is applied to half-wave rectifier. The diode may be considered to be ideal and R_L=1.2 KΩ is connected as load. Find out peak value of current, RMS value of Current, DC value of current and Ripple factor.	[7M]

Or

4	a)	What is tunneling phenomena? Explain the principle of operation of tunnel diode with its characteristics.	[8M]
	b)	Discuss the Principle of operation and draw characteristics of Silicon control rectifier (SCR).	[7M]
5	a)	Explain the operation of CC Configuration of BJT and its input and output characteristics briefly.	[8M]
	b)	Draw and explain drain and transfer characteristics of depletion type MOSFET.	[7M]

Or

6	a)	With neat diagram explain the various current components in a p-n-p transistor.	[8M]
	b)	What are the advantages of JFET over BJT? Justify JFET is the voltage control device.	[7M]
7	a)	Explain the need for biasing in electronic circuits. What are the factors affecting the stability factor.	[8M]
	b)	Explain the DC and AC load Line analysis with the help of neat diagrams?	[7M]

Or

8	a)	Draw and explain the Voltage Divider Biasing with necessary examples?	[8M]
	b)	A transistor with β = 100 is to be used in Common Emitter Configuration with collector to base bias. The collector circuit resistance is R_C = 1kΩ and V_{CC} = 10V. Assume V_{BE} = 0. i) Choose R_B so that the quiescent collector to emitter voltage is 4V. ii) Find the stability factor.	[7M]

Code No: R1921041   **R19**   SET - 3

9 a) Draw the circuit diagram of CC amplifier using hybrid parameters and derive the expression for A_I, A_V, R_i and R_O.   [8M]

   b) Explain and draw the common source FET amplifier and its equivalent circuit and derive the expressions for Av and Ri   [7M]

Or

10 a) Derive the expressions for Voltage gain and current gain for CE amplifier.   [8M]

   b) For the Common Source Amplifier, calculate the value of the voltage gain, given   [7M]
       i) rd =100KΩ, R_L=10KΩ, gm=300μ and R_O=9.09KΩ.
       ii) If C_{DS}=3pF, determine the output impedance at a signal frequency of 1 MHz.

Code No: R1921041 $\boxed{\text{R19}}$ $\boxed{\text{SET - 4}}$

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Time: 3 hours   Max. Marks: 75

Answer any **FIVE** Questions each Question from each unit
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1	a)	Define diffusion and transition capacitance of p-n junction diode. Prove that diffusion capacitance is proportional to current I.	[8M]
	b)	Obtain the static and dynamic resistances of the p-n junction germanium diode, if the temperature is 27^0 C and Io=1μA for an applied forward bias of 0.2 V. Assume =$1.38×10^{-23}$J/^{0}k.	[7M]

Or

2	a)	Derive the expression for Concentration of Hole and Electron in an intrinsic semiconductor and also draw the Fermi level position in intrinsic semiconductor.	[8M]
	b)	State and prove continuity equation.	[7M]
3	a)	Draw the circuit diagram of full wave rectifier with L-section filter and explain its operation?	[8M]
	b)	Explain the working of Tunnel diode and its V-I characteristics. And what is the sufficient condition for tunneling?	[7M]

Or

4	a)	Construct Bridge rectifier circuit and derive equation for I_{DC}, V_{DC}, I_{RMS}, V_{RMS}, and Rectifier efficiency.	[8M]
	b)	With suitable diagrams explain the operation of varactor diode?	[7M]
5	a)	Explain input and output characteristics of transistor in CB configuration with neat diagram.	[8M]
	b)	Describe the construction and working principle of Enhancement mode and depletion mode MOSFET and draw its characteristics.	[7M]

Or

6	a)	Explain CE configuration with the help of input and output characteristics.	[8M]
	b)	Draw the construction diagram, operation characteristics and parameters of JFET?	[7M]
7	a)	Write a short note on Stabilization against variations in V_{BE} and β.	[8M]
	b)	List out different types of biasing methods. Derive the equation for stability factor for fixed bias.	[7M]

Or

8	a)	Explain the terms Bias Stabilization and Bias Compensation.	[8M]
	b)	Determine the quiescent currents and the collector to emitter voltage for a Ge transistor with β = 50 in the self biasing arrangements. The circuit component values are V_{CC} = 20V, R_C = 2kΩ, Re = 0.1 kΩ, R_1 = 100 kΩ and R_2 = 5 kΩ. Find the stability factor S.	[7M]

9 a) For CG amplifier, draw the small signal equivalent circuit and determine   [8M]
       expression for gain, input impedance and output impedance?
   b) Draw the small signal equivalent circuit of FET amplifier in CS connection and   [7M]
       derive the equations for voltage gain, input impedance and output impedance?

                                            Or

10 a) Draw the circuit of source follower Amplifier and derive the expressions for A_I,   [8M]
        A_V, R_i and Ro.
    b) Draw the Common emitter amplifier with Emitter resistor and explain its   [7M]
        operation.