II B. Tech I Semester Regular/Supplementary Examinations, December-2023
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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UNIT-I

1　a)　Explain about Fermi level in intrinsic and extrinsic Semiconductors with the help of energy band diagrams.　[7M]

　　b)　Derive the expression for transition capacitance in a PN diode.　[7M]

OR

2　a)　What are direct and indirect band gap semiconductors? Explain with examples.　[7M]

　　b)　Explain PN diode characteristics in forward bias and reverse bias regions.　[7M]

UNIT-II

3　a)　Compare FWR and Bridge rectifier.　[7M]

　　b)　Explain the working of Zener diode and its V-I characteristics. And what is the sufficient condition for regulation.　[7M]

OR

4　a)　Derive the expression for Ripple factor for Full Wave Rectifier with L-section filter.　[7M]

　　b)　How LED works? Explain in details with neat diagrams.　[7M]

UNIT-III

5　　　The reverse leakage current of the transistor when in CB configuration is 0.3μA while it is 16μA when the same transistor is connected in CE configuration. Determine α, β and γ.　[14M]

OR

6　a)　Explain input and output characteristics of the transistor in CC configuration withdiagrams. How do you obtain from these?　[7M]

　　b)　An FET has a drain current of 4 mA. If I_{dss} =8mA and $V_{gs(off)}$ = - 6V, find the value of Vgs and V_p.　[7M]

UNIT-IV

7　a)　Derive expression for the stability factor S for a self - bias CE configuration.　[7M]

　　b)　Draw the circuit diagram of a voltage divider bias and derive expression for Stability factor.　[7M]

OR

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8 a) Derive the operating point using AC and DC load lines.   [7M]

   b) Draw and explain the circuit for bias compensation using diode.   [7M]

UNIT-V

9 Draw the circuit diagram of CC amplifier using hybrid parameters and derive the expression for A_I, A_V, R_i and R_O.   [14M]

OR

10 Derive the expressions for voltage gain, current gain, input impedance and output impedance of CE amplifier.   [14M]

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SET - 2

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UNIT-I

1	a)	Sketch the symbol for a PN diode, labeling the anode and cathodeand showing the polarity and current direction for forward bias.	[7M]
	b)	Derive the continuity equation and write its utility towards current flow.	[7M]

OR

2	a)	Explain Hall effect. What are its applications?	[7M]
	b)	Draw the energy band diagram of a p-n junction under open circuit condition and derive the expression for contact potential.	[7M]

UNIT-II

3	a)	Sketch diagram to show the operation and construction of a LED. Briefly explain.	[7M]
	b)	A full wave rectifier delivers 50 W to a load of 200 ohm. If the ripple factor is 1%, calculate the ac ripple voltage across the load.	[7M]

OR

4	a)	Explain about the full-wave bridge rectifier with LC filters and also draw Suitable diagram and waveforms.	[7M]
	b)	Zener diode can be used as a voltage regulator. Justify it.	[7M]

UNIT-III

5	a)	Explain input and output characteristics of transistor in CB configuration with neat diagram.	[7M]
	b)	From the transistor current components, derive the current equation of transistor with a neat sketch.	[7M]

OR

6	a)	Explain the working of a depletion type MOSFET with a neat construction diagram and its characteristics.	[7M]
	b)	Discuss the base width modulation.	[7M]

UNIT-IV

7	a)	What is Biasing? Explain the need of it. List out different types of biasing methods.	[7M]
	b)	Draw the circuit diagram of Fixed bias circuit of CE amplifier and derive expressionfor S, $S^{\mid}$ and $S^{\mid\mid}$.	[7M]

OR

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

UNIT-V

9   Draw the circuit diagram of common Emitter amplifier and derive expression for   [14M]
     voltage gain, current gain, input impedance and output admittance using
     approximate model.

OR

10   A single-stage common-source amplifier with voltage divider bias is to use a   [14M]
     FET with $V_{DD} = 22$ V and $R_L = 70$ kΩ. Sketch the circuit and determine suitable
     resistor values.

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UNIT-I

1 a) Explain the Avalanche and Zener Breakdowns in PN junction diode. [7M]

   b) Derive expression for current density of an intrinsic semiconductor. [7M]

OR

2 a) Explain the classification of material based on the conductivity and energy band diagram. [7M]

   b) Derive the expression for transition capacitance of a diode. [7M]

UNIT-II

3 a) Explain about the half-wave rectifier without filters. [7M]

   b) Draw the SCR diode? Explain the operation of SCR diode with its equivalent circuit and mention its applications. [7M]

OR

4 a) What is tunneling phenomena? Explain the principle of operation of tunnel diode with its characteristics. [7M]

   b) Compare FWR and Bridge rectifier. [7M]

UNIT-III

5 a) Write the differences between BJT & JFET. [7M]

   b) Explain the input and output characteristics of the transistor in CC configuration with diagrams. How do you obtain from these? [7M]

OR

6 a) Explain in-detail transistor working as switch. [7M]

   b) Explain the construction and working of n-channel JFET and draw the drain and transfer characteristics. [7M]

UNIT-IV

7 a) Derive the expression for stability factor of self-bias circuit. [7M]

   b) Draw and explain the circuit for bias compensation using diode. [7M]

OR

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8   a)   Explain in detail about Thermal Runaway and Thermal Resistance.   [7M]

    b)   Discuss the different biasing techniques of JFET.   [7M]

UNIT-V

9   Draw the small signal low frequency h- parameter model of CE, CB, and CC   [14M]
     configurations and compare voltage gain, current gain, input impedance, output
     impedance.

OR

10   Derive the expressions for current gain, input resistance, voltage gain and   [14M]
     output resistance of a common emitter amplifier with an emitter resistance.

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UNIT-I

1 a) Discuss the difference types of junction breakdown that can occurs in a reverse biased diode. [7M]
   b) Explain about p-type and n-type semiconductors. [7M]

OR

2 a) Explain operation of diode in forward bias and reverse bias condition. Draw V-I characteristics of diode. [7M]
   b) Derive expression for current density of an intrinsic semiconductor. [7M]

UNIT-II

3 a) Explain about the full-wave center-tap rectifier with L section filters and also Draw suitable diagram and waveforms. [10M]
   b) Write the applications of SCR and UJT. [4M]

OR

4 a) Define varactor diode. Explain the operation of varactor diode with its equivalentcircuit and mention its applications. [9M]
   b) What is meant by ripple factor and derive the expression for HWR. [5M]

UNIT-III

5 a) Draw the input output characteristics of NPN transistor in CE configuration and explain. [7M]
   b) Explain the MOSFET characteristics in enhancement mode. [7M]

OR

6   Compare the characteristics of a BJT in CB, CE and CC configurations. [14M]

UNIT-IV

7 a) Explain how self-biasing can be done in a BJT with relevant sketches andwaveforms. [7M]
   b) Explain in detail about the stabilization against variations in V_{BE} and β. [7M]

OR

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8　a)　What is meant by transistor biasing? Why it is needed? Explain.　　　　[7M]

　　b)　Explain about Themistor Compensation and Sensitor Compensation.　　　[7M]

UNIT-V

9　　With suitable circuit diagram, explain the analysis of CG, CS and CD amplifiers　[14M]
　　　in all aspects.

OR

10　　With the help of a neat schematic, explain the functioning of a common source　[14M]
　　　amplifier.

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