R20

SET - 1

II B. Tech I Semester Regular/Supplementary Examinations, January-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
~~~~~~~~~~~~~~~~~~~~~~~~~

UNIT-I

1   a)   Derive an expression for Fermi level in n – type semiconductor.   [7M]

    b)   Discuss about the current components of a PN Junction Diode and derive the diode current equation.   [7M]

OR

2   a)   Explain the formation of a potential barrier in a p-n junction and show the polarity of the Barrier potential.   [7M]

    b)   What is diffusion capacitance in PN junction diode? Derive its equation.   [7M]

UNIT-II

3   a)   Show that the Zener Diode can act as a voltage regulator with a neat circuit diagram.   [7M]

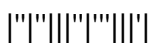   b)   Derive an expression for ripple factor of multiple L – section filter.   [7M]

OR

4   a)   Explain the Tunnel diode characteristics using energy band diagram.   [7M]

    b)   Draw the circuit diagram of a Half Wave Rectifier and explain its operation with the help of waveforms.   [7M]

UNIT-III

5   a)   Draw and explain the output characteristics of PNP type BJT of CE configuration and indicate various regions of operation.   [7M]

    b)   Explain how FET acts as a voltage variable resistor with neat sketches.   [7M]

OR

6   a)   Sketch the input and output characteristics of CB configuration and mark the cut off region, saturation region and active region from output characteristic.   [9M]

    b)   How FET will be operated as an amplifier?   [5M]
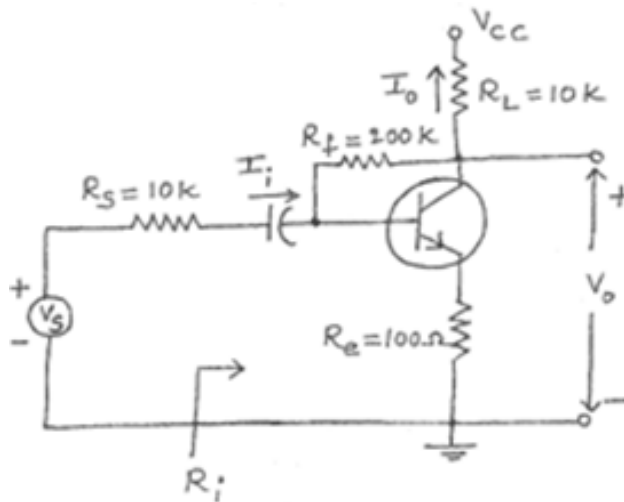
|"|"|||"|"|||'|

UNIT-IV

7 a) List the different types of Biasing a Transistor and explain the Fixed Bias of a Transistor.   [7M]

   b) Calculate the values of Resistors in a fixed bias circuit using the following specifications: I_{CQ}=9.2mA, V_{CEQ}=4.4V, h_{fe}=1115, V_{BE}=0.7V and V_{CC}=9V.   [7M]

OR

8 a) Determine the expression for stability factor 'S' for fixed bias circuit and list its disadvantages.   [7M]

   b) Define and Explain Thermal Runaway and Thermal Resistance.   [7M]
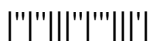
UNIT-V

9 For the transistor amplifier shown below, Compute $A_I = I_o / I_i$, A_v, A_{vs} and R_i. Assume $h_{ie} = 1100$ ohms, $h_{fe} = 50$, $h_{re} = 2.5 \times 10^{-4}$, $h_{oe} = 24$ μA/V   [14M]

OR

10 a) How to determine h-parameters of BJT using V-I characteristics curves? Explain each parameter.   [7M]

   b) With neat sketch explain the characteristics of common emitter amplifier.   [7M]

R20

II B. Tech I Semester Regular/Supplementary Examinations, January-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
~~~~~~~~~~~~~~~~~~~~~~~~~

UNIT-I

1	a)	What is minority carrier concentration? Express minority carrier concentration in p – type semiconductor.	[7M]
	b)	Explain Breakdown mechanisms in PN Junction Diode.	[7M]

OR

2	a)	Explain in detail about continuity equation.	[7M]
	b)	Derive the expression for transition capacitance of a PN Junction Diode.	[7M]

UNIT-II

|			
3	a)	Draw the V-I characteristics of SCR for different value of Gate – Currents.	[7M]
	b)	What is the need of filter? Explain the working of full wave rectifier with L-section filter.	[7M]

OR

4	a)	Explain the construction and operation of Photo diode.	[7M]
	b)	Explain the working of a half-wave rectifier with necessary waveforms and derive the expression for the ripple factor.	[7M]

UNIT-III

5	a)	Explain about Early effect. What are its consequences?	[7M]
	b)	Explain the NMOS depletion mode transistor action for different conditions of V_{ds}.	[7M]

OR

6	a)	Compare CB, CC, CE configuration of a Bipolar transistor.	[7M]
	b)	Draw the Drain characteristics of N-Channel MOSFET for different values of V_{GS} to operate either in enhancement mode or in the depletion mode. From these characteristics obtain transfer curve for a fixed V_{ds} and indicate enhancement and depletion region.	[7M]

|''|''|'|||''|''|'''|||''|'
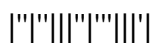
UNIT-IV

7 a) Explain self bias of a Transistor with neat circuit diagram and determine Q-point.　[7M]

   b) What is thermal runaway and what is the condition for thermal stability in CE configuration?　[7M]

OR

8 a) Design a collector to base bias circuit for the specified conditions: $V_{cc} = 15V$, $V_{CE} = 5V$, $I_C = 5mA$ and $\beta = 100$.　[7M]

   b) Explain Diode Compensation Technique for the parameters of V_{BE} and I_{CO}.　[7M]

UNIT-V

9 a) Find expressions for voltage gain, current gain, Input impedance and output impedances of CB amplifier using simplified hybrid model.　[7M]

   b) What are the benefits of h-parameters? Discuss how h–parameters can be obtained from transistor characteristics?　[7M]

OR

10 a) Give the comparison of CE, CC and CB amplifiers with respect to voltage gain current gain, Input impedance and output impedance.　[7M]

   b) Explain in detail about the CS Amplifier without Bypass capacitor.　[7M]
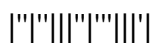
|''|''|||''|''|||''|

II B. Tech I Semester Regular/Supplementary Examinations, January-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
~~~~~~~~~~~~~~~~~~~~~~~~~

UNIT-I

1　a)　Explain in detail about continuity equation.　　[7M]

　　b)　A PN 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.　　[7M]

OR

2　a)　The mobility of free electrons and holes in pure Ge are 3800, 1800 Cm^2/V-sec. The corresponding values for pure Si are 1300 and 500 Cm^2/V-sec. Determine the values of intrinsic conductivity for both Ge & Si. Assume $n_i = 2.5 \times 10^{13}$ cm^{-3} for Ge and $n_i = 1.5 \times 10^{13}$ cm^{-3} for Si at room temperature.　　[7M]

　　b)　Discuss about the forward and reverse resistances of a PN junction diode.　　[7M]

UNIT-II

3　a)　Distinguish between Zener and avalanche breakdown mechanisms.　　[7M]

　　b)　A silicon diode having internal resistance is 20Ω is used for HWR. If the applied voltage is 50Sin(ωt) and load resistance is 800Ω. Find
　　　　　　(i) I_m, I_{dc} , I_{rms}
　　　　　　(ii) ac input and dc output power
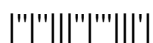　　　　　　(iii) DC output voltage and efficiency　　[7M]

OR

4　a)　Explain the operation of UJT with neat sketches.　　[7M]

　　b)　Draw the circuit of a bridge-rectifier circuit with shunt capacitance filter and derive expressions for the ripple factor. Sketch the input and output wave forms.　　[7M]

UNIT-III

5　a)　What is base width modulation? Explain in detail.　　[7M]

　　b)　Discuss about the construction and operation of JFET.　　[7M]

OR

6　a)　What is Ebers-Moll equation? How is collector current effected by temperature in the Ebers-moll model of transistor?　　[7M]

　　b)　What is Pinch-off voltage? What is it significance? Explain.　　[7M]

|"|"|||"|"|||"|

UNIT-IV

7 a) In an NPN transistor if $\beta = 50$ is used in common emitter circuit with $V_{CC} = 10V$ [7M]
       and $R_C = 2K$ Ohm. The bias is obtained by connecting 100K Ohm resistor from
       collector to base. Find the operating point.
   b) Explain diode compensation circuit for variations in V_{BE} for self-bias circuit.   [7M]
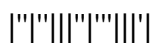
OR

8 a) Derive an expression for stability factor S^I of a BJT with Common emitter circuit   [7M]
       in self-bias.
   b) For a self-bias circuit with $V_{CC} = 22.5V$, $R_C = 5.6K\Omega$, $R_1=90K\Omega$, $h_{fe}=55$,   [7M]
       $V_{BE}=0.6V$. Determine the operating point and stability factor by assuming the
       transistor operated in active region.

UNIT-V

9   A CE amplifier is driven by a voltage source of internal resistance, $R_s = 1000\Omega$ [14M]
       and the load impedance of $R_C=2k\Omega$. The h-parameters are $h_{ie}=1.3k$, $h_{fe}=55$,
       hoe = $22\mu A/V$ and $h_{re} = 2 \times 10^{-4}$. Neglecting biasing resistors. Estimate the value
       of current gain, voltage gain, input impedance, output impedance for the value of
       emitter resistor $R_E = 200\Omega$ inserted in the   emitter circuit.

OR

10 a) Explain the CB Amplifier by using approximate model in terms of Voltage gain,   [7M]
        Current gain, Input resistance and Output resistance.
    b) With neat sketch, explain the characteristics of common emitter amplifier.   [7M]

|"|"|||"|"|||'|

II B. Tech I Semester Regular/Supplementary Examinations, January-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
~~~~~~~~~~~~~~~~~~~~~~~~~

UNIT-I

1. a) Compare conductors, insulators and semiconductors type of materials based on energy band theory. [7M]
   b) Explain P-N Junction diode action under forward bias and reverse bias conditions with a neat V-I Characteristics. [7M]

OR

2. a) For a silicon, carrier concentration at absolute temperature is $1.5 \times 10^{10}/ \text{cm}^3$, mobility of free electrons $\mu_n = 1300 \text{ cm}^2/\text{V-Sec}$ and $\mu_p = 500 \text{ cm}^2/\text{V-Sec}$. Number of silicon atoms per unit volume is 5×10^{22}. Find [7M]
       (i)   The conductivity of donor impurity of 1 in 10^8
       (ii)   The conductivity of acceptor impurity of 1 in 5×10^7
   b) Derive an expression for diffusion capacitance of a p-n junction diode. [7M]

UNIT-II

3. a) Draw the circuit symbol and label the terminals of UJT. Justify name Uni-Junction Transistor. [7M]
   b) Draw the circuit diagram of a Full-wave rectifier and derive expressions for I_{dc}, I_{rms}, P_{ac}, η_r. Sketch the relevant input and output wave forms. [7M]

OR

4. a) What is LED? How does an LED works? List five applications of LEDs. [7M]
   b) With the help of a neat diagram, explain the operation of a Bridge Rectifier. What is PIV for the diode used here? [7M]

UNIT-III

5. a) Explain the construction of NPN transistor with a neat diagram. [7M]
   b) List out the comparisons between BJT, JFET and MOSFET. [7M]

OR

6. a) Derive transistor current relation in CB configuration. [7M]
   b) Explain the construction and working principle of N-Channel JFET. [7M]

|"|"|||"|"|||'|
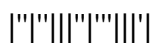
UNIT-IV

7 a) For a Collector to base bias configuration, derive expression for the stability   [7M]
       factor S.
   b) What is thermal runaway? Derive the condition for thermal stability in CE   [7M]
       configuration.

OR

8 a) For the circuit shown in the figure, determine the operating point with $\beta = 100$.   [7M]

Vcc=10V

1kohm

4 kohm

I_C
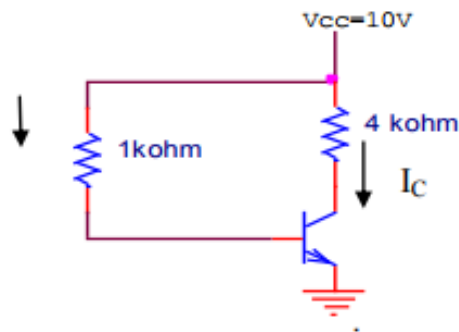
   b) Discuss about the biasing of FET.   [7M]

UNIT-V

9 a) Draw the hybrid model for a transistor in CE configuration and derive its hybrid   [7M]
       parameters.
   b) Differentiate between CE, CB and CC amplifiers.   [7M]

OR

10 a) A CE amplifier is driven by a voltage source of internal resistance $R_s = 800\Omega$ [7M]
       and the load impedance of $R_L=1000\Omega$. The h-parameters are $h_{ie}=1k$, $h_{fe}=50$,
       $h_{oe} = 25\mu A/V$ and $h_{re} = 2 \times 10^{-4}$. Find current gain, voltage gain, input
       impedance and output impedance using exact analysis.
   b) Draw the small signal model of FET.   [7M]

|"|"|||"|"|||'|