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CODE NO: **A109210203** | R09 | SET - 1

II B.TECH - I SEMESTER EXAMINATIONS – MAY, 2011
ELECTRONIC DEVICES AND CIRCUITS
(Common to EEE, ECE, CSE, EIE, BME, IT, MCT, ECC, ETM, ICE)

Time: 3hours **Max. Marks: 75**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1.a) Explain the V-I characteristics of Zener diode and distinguish between Avalanche and Zener Break downs.
b) In a Zener diode regulator, the supply voltage = 300V, V_z = 220V, I_z = 15mA and load current = 25mA. Calculate the value of resistor required to be connected in series with the Zener diode. [7+8]

2.a) Derive the expression for the ripple factor of π-Section filter when used with a Half-wave-rectifier. Make necessary approximations.
b) Draw the circuit of bridge rectifier and explain its operation with the help of input and output waveforms. [7+8]

3.a) Explain different current components in a transistor.
b) Write short notes on Early effect.
c) Draw input and output characteristics of a transistor in common emitter configurations. [5+5+5]

4.a) Why a transistor needs biasing? Explain.
b) Draw the self bias circuit and obtain the expression for the stability factor. Discuss the advantages and disadvantages of self biasing. [7+8]

5.a) For the transistor connected in CE configuration, determine A_V, A_I, R_i and R_O using the complete hybrid equivalent model. Given $R_L = R_S = 1K\Omega$, $h_{ie} = 1K\Omega$, $h_{re} = 2x10^{-4}$, $h_{fe} = 100$, $h_{oe} = 20\ \mu A/V$.
b) Draw the circuit diagram of CC amplifier using hybrid parameters and derive expressions for A_I, A_V, R_i, R_O. [8+7]

6.a) Sketch the drain characteristics of MOSFET for different values of V_{GS} & mark different regions of operation.
b) Give the construction details of JFET and explain its operation. [8+7]

7.a) Write short notes on applications of FET as a voltage variable resistor.
b) Explain the principle of CS amplifier with the help of circuit diagram. Derive the expressions for A_V, input impedance and output impedance. [7+8]

8.a) Explain the tunneling phenomenon. Explain the characteristics of tunnel diode with the help of necessary energy band diagrams.
b) What is the photo diode? Explain its principle of operation and applications in detail. [8+7]

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Time: 3hours **Max. Marks: 75**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1.a) Explain the effect of temperature on V-I characteristics of a diode.
b) Distinguish between drift and diffusion current in a semiconductor. State continuity equation. [7+8]

2.a) Draw the circuit of a half-wave-rectifier and find out the ripple factor, % regulation, efficiency and PIV.
b) Compare the performance of Inductor filter and capacitor filter. [8+7]

3.a) Draw the circuit diagram of a transistor in CB configuration and explain the output characteristics with the help of different regions.
b) In a germanium transistor collector current is 51mA, when current is 0.4mA. If $h_{fe} = \beta_{dc} = 125$, Calculate cut off current, I_{CEO}. [7+8]

4.a) What are the compensation techniques used for V_{BE} and I_{CO}. Explain with help of suitable circuits.
b) Draw a fixed bias circuit and explain its operation. [8+7]

5.a) Compare the three transistor amplifier configurations with related to A_I, A_V, R_i and R_O.
b) For the emitter follower with $R_S = 0.5K$, $R_L = 50K$, $h_{fe} = -50$, $h_{ie} = 1K$, $h_{oe} = 25\mu A/V$, $h_{re} = 1$. Calculate A_V, A_I, Z_i and Z_O. [7+8]

6.a) Explain the working of MOSFET in
i) Enhancement mode ii) Depletion mode.
Draw the necessary diagrams and graphs.
b) Explain the operation of FET with its characteristics and explain the different regions in transfer characteristics. [8+7]

7.a) Give the construction details of UJT & explain its operation with the help of equivalent circuits.
b) Compare BJT & FET. [7+8]

8.a) Write in detail:
i) Varactor diode
ii) Schottky Barrier diode
with necessary sketches. [7+8]

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Time: 3hours **Max. Marks: 75**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1.a) What is potential energy barrier of the p-n junction? How does it arise and what is its order of magnitude?
b) Sketch the V-I characteristics of p-n junction diode for forward bias voltages. Distinguish between the incremental resistance and the apparent resistance of the diode. [7+8]

2. With suitable diagrams, explain the working of centre-tapped full wave rectifier. Derive expressions for V_{DC}, I_{DC}, V_{rms} and I_{rms} for it. [15]

3.a) Explain the constructional details of Bipolar Junction Transistor.
b) Explain Current Amplification in CE configuration. [8+7]

4.a) Explain Voltage Divider biasing of a transistor.
b) Define the stability factors with respect to the changes in I_{CO}, V_{BE} and β. Why is the stability with respect to changes in V_{CE} not considered? [7+8]

5.a) Define the hybrid parameters for a basic transistor circuit in any configuration and give its hybrid model.
b) For the h-parameters of a transistor, show that

$$h_{fb} = -\frac{h_{fe}}{1+h_{fe}} \text{ and } h_{ob} = \frac{h_{oe}}{1+h_{fe}}$$ [7+8]

6.a) The field effect transistor is called a voltage-sensitive electronic control device. Explain why is the case?
b) Name and define the circuit parameters of the JFET. How are they related to each other? [8+7]

7.a) Write the expressions for mid-frequency gain of a FET Common Source Amplifier.
b) Discuss the high frequency response of CD Configuration. [8+7]

8.a) Explain the construction and working of photo diode.
b) Sketch the static characteristics and firing characteristics of SCR and explain the shape of the curve. [8+7]

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Time: 3hours **Max. Marks: 75**

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1.a) Explain in detail, the reason for exponential rise in forward characteristic of a diode with suitable mathematical expression.
b) Explain in detail, the variation of following semiconductor parameters with temperature,
i) Energy gap ii) Conductivity. [7+8]

2.a) Explain the working of Bridge rectifier with necessary sketches and parameters.
b) Explain the relative merits and demerits of all the rectifiers. [8+7]

3.a) Draw the energy variation curve in the conduction band for an open circuited n-p-n transistor. How is the curve modified when the transistor is operating in active region?
b) A silicon n-p-n transistor with $\alpha = 0.995$ and I_{CO}=15 nA, operates in the CE configuration. What is the collector current for a base current of 20μA? [8+7]

4.a) What do you mean by the quiescent point of transistor amplifier?
b) What is a load line? Explain its significance.
c) Find the Q-point of self-bias transistor circuit with the following specifications:
$V_{CC} = 22.5V$, $R_L = 5.6k\Omega$, $R_C = 1k\Omega$, $R_I = 90k\Omega$, $R_2 = 10k\Omega$, $V_{BE} = 0.7V$ and $\beta = 55$.
Assume $I_B >> I_{CO}$. [5+5+5]

5.a) Draw the low frequency hybrid - ∏ model and explain the meaning of each component of a model.
b) A given transistor with I_C = 10mA, V_{CE} = 10V and at room temperature has the following set of low frequency parameters: $h_{ie} = 500\Omega$, $h_{oe} = 10^{-5}$A/V, $h_{fe} = 100$, $h_{re} = 10^{-4}$. Find the values of all the hybrid - ∏ parameters of a low frequency model. [7+8]

6.a) Bring out neat comparison between JFET and MOSFET.
b) List the advantages and disadvantages of FET over MOSFET. [7+8]

7.a) What is the effect of external source resistance on the voltage gain of a common source amplifier? Explain with necessary derivations.
b) How a small signal high frequency model is different from a low-frequency model? Explain it briefly. [7+8]

8.a) Explain the working of Tunnel diode with help of energy band diagrams.
b) Explain Schottky diode with necessary sketches. [7+8]

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