Hall Ticket No | | | | | | | | | | | Question Paper Code: AECB06

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER

B.Tech III Semester End Examinations, November - 2019

Regulations: IARE-R18

ELECTRONIC DEVICES AND CIRCUITS

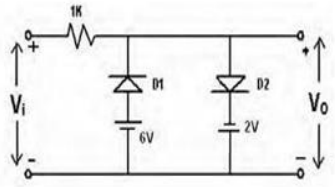
(Common to ECE/EEE)

Time: 3 hours **Max. Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1	a)	Sketch the V-I characteristics of p-n junction diode for forward bias and reverse bias voltages. Distinguish between the static and dynamic resistance of the diode?	[7M]
	b)	The reverse saturation current of a silicon p – n function diode at an operating temperature of 270C is 50 nA. Estimate the dynamic forward and reverse resistances of the diode for applied voltages of 0.8 V and -0.4 V respectively?	[7M]
2	a)	With the help of a neat circuit diagram explain the working of different diode clippers.	[7M]
	b)	Determine Vo for the network shown in Figure for the given 16V P-P sin wave input. Also sketch the transfer characteristics. (Assume ideal diodes)	[7M]



MODULE – II

3	a)	With a neat diagram explain the various current components in an NPN bipolar junction transistor & hence derive general equation for collector current, I_C?	[7M]
	b)	A certain transistor has α of 0.98 and a collector leakage current I_{C0} of 1 µA. Calculate the collector and base currents, when I_E= 1 mA.	[7M]
4	a)	Define h-parameters. Explain how do you determine h-parameters of a transistor from its characteristics?	[7M]
	b)	A transistor has I_B=105 µA and I_C=2.05mA. Find (a) β of the transistor (b) α of the transistor (c) emitter current I_E (d) Now, if I_B changes by 27 µA and I_C changes by 0.65mA,find the new value of β.	[7M]

MODULE – III

5 a) Draw the frequency response of BJT amplifier and explain the effect of bypass capacitor on the frequency response in detail. [7M]

b) In a Silicon transistor circuit with a fixed bias, VCC=25V, RC=820Ω, RB=180KΩ, β = 80, VBE=0.7V. Determine the values of base current, emitter current and the collector to emitter voltage. [7M]

6 a) Draw the circuit diagram of CE amplifier with emitter resistance and derive the expression for AI , AV, Ri and RO using hybrid model. [7M]

b) The hybrid parameters for a transistor used in CE configuration are hie = 5kΩ; hfe = 180; hre = 1.25 × 10-4; hoe = 16 × 10-6 ohms. The transistor has a load resistance of 20 KΩ in the collector and is supplied from a signal source of resistance 5 KΩ. Compute the value of input impedance, output impedance, current gain and voltage gain. [7M]

MODULE – IV

7 a) Explain the operation of FET with its characteristics and explain the different regions in transfer characteristics? [7M]

b) In an n-channel FET, the effective channel width is 3×10^{-4}cm and the donor impurity concentration is 10^{15} electrons/cm^3. Find the pinch-off voltage? [7M]

8 a) Explain the principle of MOSFET in depletion mode with neat sketches and output characteristics. [7M]

b) A self biased p – channel JFET has a pinch – off voltage of VP = 5 V and IDSS = 12 mA. The supply voltage is 12 V. Determine the values of RD and RS so that ID = 5 mA and VDS = 6V? [7M]

MODULE – V

9 a) Draw the small-signal model of common drain FET amplifier. Derive expressions for voltage gain and output resistance? [7M]

b) A Common Source FET amplifier circuit with un bypassed Rs has the following circuit parameters: Rd = 10K, RS = 0.8K, Rg = 1.2M, rd = 6K, gm= 15mS and VDD = 15 V. Determine AV& RO? [7M]

10 a) Explain the tunneling phenomenon. Explain the characteristics of tunnel diode with the help of necessary energy band diagrams? [7M]

b) A Zener voltage regulator circuit is to maintain constant voltage at 60 V, over a current range from 5 to 50 mA. The input supply voltage is 200 V. Determine the value of resistance R to be connected in the circuit, for voltage regulation from load current IL = 0 mA to IL max, the maximum possible value of IL. What is the value IL max? [7M]

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I. COURSE OBJECTIVES

The course should enable the students to:

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I	Introduce components such as diodes, BJTs and FETs.
II	Know the applications of components
III	Know the switching characteristics of components.
IV	Give understanding of various types of amplifier circuits.

II. COURSE OUTCOMES

Students who complete the course will have demonstrated the ability to do the following

COs	Course Outcome	CLOs	Course Learning Outcome
CO 1	Describe diode operation, transition capacitance, diffusion capacitance and the use of diode in various electronic circuits.	CLO 1	Understand and analyze diodes operation and static and dynamic resistance in order to design basic circuits.
		CLO 2	Understand diffusion and transition capacitance of diode in forward and reverse bias conditions.
		CLO 3	Understand and analyze diode applications and how the diode acts as a switch.
		CLO 4	Design rectifier without and with capacitive filters for the given specifications.
		CLO 5	Understand the use of diodes in typical circuits like, clipping, clamping circuits and comparator circuits.
CO 2	Understand the principle of operation of BJT in CE, CB, CC configuration and analyze transistor hybrid model.	CLO 6	Understand the principle of operation and characteristics of common emitter, common base and common collector configurations.
		CLO 7	Understand the concept of operating point, DC & AC load lines.
		CLO 8	Analyze transistor hybrid parameter model for CE, CB and CC configurations.
		CLO 9	Determine of h-parameters of BJT amplifier from transistor characteristics.
		CLO 10	Understand the use of conversion of h-parameters among CE, CB and CC configurations.
CO 3	Bias the transistors and analyze the low frequency response of BJT amplifiers.	CLO 11	Identify the various transistor biasing circuits, compensation circuits and its usage in applications like amplifiers.
		CLO 12	Analyze various transistor configurations and asses merits and demerits for different applications.
		CLO 13	Analyze CE Amplifier with emitter resistance.

COs	Course Outcome	CLOs	Course Learning Outcome
		CLO 14	Analyze low frequency response of BJT Amplifiers.
		CLO 15	Understand the effect of coupling and bypass capacitors on CE Amplifier.
CO 4	Study and analyze the behaviour of FET and MOSFET.	CLO 16	Explain construction and principle of operation of JFET.
		CLO 17	Understand the concept of pinch-off voltage and volt-ampere characteristic of JFET.
		CLO 18	Distinguish the constructional features and operation of BJT and FET and their applications.
		CLO 19	Understand biasing of FET and how it acts as voltage variable resistor.
		CLO 20	Discuss the construction of MOSFET and steady the VI characteristics, as it is the prime component in VLSI technology.
CO 5	Analyze FET amplifiers in CS,CG,CD modes using small signal model and study the behaviour of special purpose diodes.	CLO 21	Apply small-signal models to field effect transistors and determine the voltage gain and input and output impedances.
		CLO 22	Analyzes CS, CD, CG JFET amplifiers using small signal model.
		CLO 23	Understand basic concepts of MOSFET amplifiers.
		CLO 24	Explain the operation of Zener diode and its usage in voltage regulating application.
		CLO 25	Understand the principle of operation and characteristics of silicon controlled rectifier, tunnel diode, UJT and varactor diode.

MAPPING OF SEMESTER END EXAMINATION TO COURSE OUTCOMES

SEE Question No.		CO	Course Outcomes	Blooms Taxonomy Level
1	a	CO 1	Describe diode operation, transition capacitance, diffusion capacitance and the use of diode in various electronic circuits.	Understand
	b	CO 1	Describe diode operation, transition capacitance, diffusion capacitance and the use of diode in various electronic circuits.	Understand
2	a	CO 1	Describe diode operation, transition capacitance, diffusion capacitance and the use of diode in various electronic circuits.	Remember
	b	CO 1	Describe diode operation, transition capacitance, diffusion capacitance and the use of diode in various electronic circuits.	Understand
3	a	CO 2	Understand the principle of operation of BJT in CE, CB, CC configuration and analyze transistor hybrid model.	Understand
	b	CO 2	Understand the principle of operation of BJT in CE,	Understand

SEE Question No.		CO	Course Outcomes	Blooms Taxonomy Level
			CB, CC configuration and analyze transistor hybrid model.	
4	a	CO 2	Understand the principle of operation of BJT in CE, CB, CC configuration and analyze transistor hybrid model.	Remember
	b	CO 23	Understand the principle of operation of BJT in CE, CB, CC configuration and analyze transistor hybrid model.	Understand
5	a	CO 3	Bias the transistors and analyze the low frequency response of BJT amplifiers.	Remember
	b	CO 3	Bias the transistors and analyze the low frequency response of BJT amplifiers.	Remember
6	a	CO 3	Bias the transistors and analyze the low frequency response of BJT amplifiers.	Understand
	b	CO 3	Bias the transistors and analyze the low frequency response of BJT amplifiers.	Remember
7	a	CO 4	Study and analyze the behaviour of FET and MOSFET.	Remember
	b	CO 4	Study and analyze the behaviour of FET and MOSFET.	Understand
8	a	CO 4	Study and analyze the behaviour of FET and MOSFET.	Remember
	b	CO 4	Study and analyze the behaviour of FET and MOSFET.	Understand
9	a	CO 5	Analyze FET amplifiers in CS,CG,CD modes using small signal model and study the behaviour of special purpose diodes.	Understand
	b	CO 5	Analyze FET amplifiers in CS,CG,CD modes using small signal model and study the behaviour of special purpose diodes.	Remember
10	a	CO 5	Analyze FET amplifiers in CS,CG,CD modes using small signal model and study the behaviour of special purpose diodes.	Understand
	b	CO 5	Analyze FET amplifiers in CS,CG,CD modes using small signal model and study the behaviour of special purpose diodes.	Understand

Signature of Course Coordinator **HOD, ECE**