Hall Ticket No | | | | | | | | | | |

Question Paper Code: AECB02

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER -II

B.Tech III Semester End Examinations, November - 2019

Regulations: IARE-R18

ANALOG ELECTRONICS

(EEE)

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

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

MODULE – I

1 a) Draw and explain the input and output characteristics of a transistor in CE configuration? [7M]

b) If the base current in a transistor is 20μA when the emitter current is 6.4mA, what are the values of α_{dc} and β_{dc}? Also determine the collector current? [7M]

2 a) Explain the operation of clamper circuits with neat output waveforms. [7M]

b) For a CB transistor amplifier driven by a voltage source of internal resistance R_s=1200Ω, R_L=1000Ω. The h-parameters are h_{ib} = 22Ω, h_{fb} = -0.98, h_{rb} =3*10^{-4}, and h_{ob}=0.5*10^{-6} A/V. Compute the current gain, input impedance and output impedance, overall voltage gain, overall current gain, power gain. [7M]

MODULE – II

3 a) Explain the construction & operation of a P-channel MOSFET in enhancement and depletion modes with the help of static drain and transfer characteristics? [7M]

b) A self biased p – channel JFET has a pinch – off voltage of V_P = 5 V and I_{DSS} = 12 mA. The supply voltage is 12 V. Determine the values of R_D and R_S so that I_D = 5 mA and V_{DS} = 6V? [7M]

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

b) Common Source FET amplifier circuit has the following circuit parameters: R_D = 5KΩ, R_G = 10MΩ, r_d = 35KΩ, μ=50. Determine AV,R_i& RO? [7M]

MODULE – III

5 a) Draw and explain the two stage amplifier with Darlington connection. Give the advantages of this circuit. What are the drawbacks of a Darlington amplifier. [7M]

b) A CE-CE(cascade) Amplifier uses RS=1KΩ, . RC1=15KΩ, RE1=100Ω , RC2=4KΩ , RE2=330Ω,R1=200KΩ R2=10KΩ for the first stage, for second stage R1=47KΩ, R2=4.7KΩ . The h-parameters hie=1.2K, hre=2.5*10-4 , hfe=50, hoe=25*10-6 A/V. Compute individual & overall A I & AV, Ri, Ri , Ro. [7M]

6 a) Draw the circuit diagram for class-A power amplifier and explain its operation. Show that the maximum conversion efficiency is 25%. [7M]

b) A single transistor is acting as ideal Class B amplifier with load of 1KΩ, if DC collector current is 15mA, V_{CC}=20V. Determine its efficiency. [7M]

MODULE– IV

7 a) What type of feedback is used in electronic amplifiers? What are the advantages of this type of feedback. Prove each one mathematically. [7M]

b) Calculate the gain, input impedance, output impedance of voltage shunt feedback amplifier having A=300, Ri=1.5K, RO=50K and β =1/12. [7M]

8 a) Derive an expression for frequency oscillation of Colpitts oscillator using transistor. [7M]

b) A Hartley oscillator is designed with L = 20μH and a variable capacitance. Find the Range of capacitance values if the frequency of oscillation is varied between 950 KHz to 2050 KHz. [7M]

MODULE –V

9 a) Draw and explain the operation of an op-amp as an integrator and differentiator for square wave input. [7M]

b) Design a differentiator to differentiate an input signal that varies in frequency from 10 Hz to about 1 KHz. If a sine wave of 1V peak at 1000 Hz is applied to this differentiator draw the output waveforms. [7M]

10 a) With a neat diagram explain about free running oscillator and derive the frequency of Oscillations. [7M]

b) Design and draw the wave forms of 1KHZ square waveform generator for duty cycle D=25%. [7M]

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COURSE OBJECTIVES

I	Explain the components such as diodes, BJTs and FETs their switching characteristics, application.
II	Learn the concepts of high frequency analysis of transistors.
III	Describe the various types of basic and feedback amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers.
IV	Discuss the basic building blocks of linear integrated circuits.
V	Understand the concepts of waveform generation and introduce some special function ICs.

COURSE OUTCOMES

CO 1	Describe the concept of diode and transistor operation with applications.
CO 2	Understand the principle of operation of MOSFET in CS, CG, CD amplifiers and analyze MOSFET with high frequency equivalent circuit.
CO 3	Analyze the different types of multistage amplifiers and Power amplifiers.
CO 4	Study and analyze the different characteristics of feedback amplifiers and oscillators.
CO 5	Understand the principle of operation of Op-amp characteristics with different applications.

COURSE LEARNING OUTCOMES

AECB02.01	Understand the basic concept of PN diode with characteristics.
AECB02.02	Analyze the application of diode in Rectifiers, clippers and clampers.
AECB02.03	Understand the working of different configurations of Bipolar Junction Transistor.
AECB02.04	Design the various biasing circuits.
AECB02.05	Analyze the different types of Amplifiers with BJT.
AECB02.06	Understand the principle of operation of MOSFET and as switch.
AECB02.07	Apply small-signal model to MOSFET and determine the voltage gain and input and output impedances.
AECB02.08	Analyze the MOSFET characteristics of common source, common gate and common drain amplifiers.
AECB02.09	Determine the parameters of MOSFET amplifier from drain and transfer characteristics.
AECB02.10	Analyze the high frequency equivalent circuit model of MOSFET.
AECB02.11	Understand the classification of transistor amplifiers.
AECB02.12	Understand the different coupling schemes used in amplifiers.
AECB02.13	Analyze frequency response of multistage amplifiers.
AECB02.14	Analyze hybrid-pi model of BJT.
AECB02.15	Analyze the different types of power amplifiers.
AECB02.16	Understand the concept of characteristics of feedback amplifiers.
AECB02.17	Analyze the different configurations of feedback amplifiers.
AECB02.18	Distinguish the constructional features and operation of feedback amplifiers and oscillators.
AECB02.19	Understand the basic concept of condition for oscillations.
AECB02.20	Analyze the different types of oscillators.
AECB02.21	Understand the basic concept Operational amplifier.
AECB02.22	Analyze different characteristics of OP-amp.
AECB02.23	Understand the different types of op-amp based on input.
AECB02.24	Analyze the different applications of Op-amp.
AECB02.25	Design the different types of waveform generators.

MAPPING OF SEMESTER END EXAMINATION TO COURSE LEARNING OUTCOMES

SEE Question No		Course Learning Outcomes		Course Outcomes	Blooms Taxonomy Level
1	a	AECB02.01	Understand the basic concept of PN diode with characteristics.	CO 1	Understand
	b	AECB02.01	Understand the basic concept of PN diode with characteristics.	CO 1	Remember
2	a	AECB02.02	Analyze the application of diode in Rectifiers, clippers and clampers.	CO 1	Understand
	b	AECB02.01	Understand the basic concept of PN diode with characteristics.	CO 1	Understand
3	a	AECB02.09	Determine the parameters of MOSFET amplifier from drain and transfer characteristics.	CO 2	Understand
	b	AECB02.07	Apply small-signal model to MOSFET and determine the voltage gain and input and output impedances.	CO 2	Remember
4	a	AECB02.08	Analyze the MOSFET characteristics of common source, common gate and common drain amplifiers.	CO 2	Understand
	b	AECB02.09	Determine the parameters of MOSFET amplifier from drain and transfer characteristics.	CO 2	Understand
5	a	AECB02.13	Analyze frequency response of multistage amplifiers.	CO 3	Remember
	b	AECB02.12	Understand the different coupling schemes used in amplifiers.	CO 3	Understand
6	a	AECB02.15	Analyze the different types of power amplifiers.	CO 3	Understand
	b	AECB02.15	Analyze the different types of power amplifiers.	CO 3	Understand
7	a	AECB02.16	Understand the concept of characteristics of feedback amplifiers.	CO 4	Understand
	b	AECB02.17	Analyze the different configurations of feedback amplifiers.	CO 4	Understand
8	a	AECB02.19	Understand the basic concept of condition for oscillations.	CO 4	Understand
	b	AECB02.20	Analyze the different types of oscillators.	CO 4	Understand
9	a	AECB02.22	Analyze different characteristics of OP-amp.	CO 5	Understand
	b	AECB02.23	Understand the different types of op-amp based on input.	CO 5	Understand
10	a	AECB02.24	Analyze the different applications of Op-amp.	CO 5	Remember
	b	AECB02.25	Design the different types of waveform generators.	CO 5	Remember

Signature of Course Coordinator **HOD, ECE**