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PRESIDENCY UNIVERSITY BENGALURU

 **SET-A**

SCHOOL OF ENGINEERING

**END TERM EXAMINATION – MAY/JUNE 2024**

**Semester :** Semester II - 2023

**Course Code :** ECE2001\_v02

**Course Name :** Analog Electronics

**Program :** B. Tech.

**Date :** JUNE 20, 2024

**Time :** 1:00 PM - 4:00 PM

# Max Marks : 100

**Weightage :** 50%

# Instructions:

1. *Read all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculator are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

**PART A**

**ANSWER ANY THREE QUESTIONS (3 Q X 5 M = 15 M)**

1. The Q Point of the diode is the relationship between the diode forward voltage and current defined by the device characteristic.

What is the operating point of the diode? Illustrate the load line analysis of the diode and its significance.

(CO5,CO1) [Knowledge]

1. The operating point of a transistor is a steady-state DC voltage and current level at which a transistor operates.

For the fixed bias circuit shown, illustrate the load line analysis of a transistor.

(CO2,CO5) [Knowledge]

1. The metal–oxide semiconductor field-effect transistor is a type of field-effect transistor with a thin layer of silicon oxide between the gate and the channel.

Give 5 distinguishing points to compare D-MOSFET and E-MOSFET.

(CO5,CO3) [Knowledge]

1. One of the most important characteristics of the FET is its high input impedance. Draw the symbols of n-channel and p-channel JFET indicating their terminals. Show the construction of the n-channel JFET and draw its drain characteristics.

(CO5,CO3) [Knowledge]

1. An electronic oscillator is an electronic circuit that produces a periodic, oscillating, or alternating current (AC) signal.

With the use of a proper diagram explain the concept of Barkhausen Criterion.

(CO5,CO4) [Knowledge]

**PART B**

**ANSWER ANY TWO QUESTIONS (2 Q X 20 M = 40 M)**

1. Three basic BJT amplifier configurations are generally identified as common-emitter, common-base, and common-collector.

Thoroughly compare the different transistor configurations with their input and output parameters and draw the typical input and output characteristic curves. Derive the relationship between Alpha, Beta, and Gamma for all three configurations.

(CO2,CO5) [Comprehension]

1. JFET or Junction Field Effect Transistor is one of the simplest types of field-effect transistor. Illustrate the working of the n-channel JFET with neat diagrams in detail.

For the JFET in Figure, *V*GS (off) = -4 V and *I*DSS = 12 mA. Determine the minimum value of VDD required to put the device in the constant-current region of operation when VGS = 0 V.



(CO5,CO3) [Comprehension]

1. A transistor can work as an oscillator to produce continuous undamped oscillations of any desired frequency. Explaining the concept of Feedback, and with a neat circuit diagram illustrate the working of the Hartley Oscillator.

For a certain Hartley oscillator, calculate the (i) operating frequency and (ii) feedback fraction. Given:

The mutual inductance between the coils, M = 20 μH and *L*1 = 1000 µH ; *L*2 = 100 µH

(CO4,CO5) [Comprehension]

**PART C**

**ANSWER ANY THREE QUESTIONS (3 Q X 15 M = 45 M)**

1. Diodes are used in a variety of applications. Answer according to the given statements:
	1. In an electronics lab, 3 diodes A, B, and C are used in a circuit. When forward-biased, diode A diode B diode C started conducting at 0.3 V, 0.7V, and 0.7V respectively. When reverse-biased, diodes A and B did not conduct. However, diode C started conducting after 5.6 V and the voltage across the diode C remained constant. Identify the diodes A, B, and C.
	2. The average output voltage of a rectifier circuit X is found to be double that of the average output voltage of a rectifier circuit Y. Name rectifier circuits X and Y. Draw the circuit diagram of rectifier X.
	3. Find the voltage VA in the circuit shown in Fig. Use a simplified model.



(CO1,CO5) [Application]

1. In electronics, biasing is the setting of DC operating conditions of an electronic component that processes time-varying signals. List all the transistor biasing techniques. With a neat circuit explain the voltage divider configuration with appropriate expressions.

For a voltage divider configuration circuit, Determine the DC bias voltage VCE and the current IC.Given R1=39kΩ, R2=3.9KΩ, RE=1.5KΩ, RC=10KΩ, VCC=22V, and β=100.

(CO2,CO5) [Application]

1. Pinch-off voltage in a JFET is the gate to source voltage at which the drain current reaches the maximum current, IDSS. With a neat construction diagram of n-channel JFET illustrate the pinch-off condition and explain.

(CO3,CO5) [Application]

1. Feedback amplifiers are used in most of the electronic amplifier circuits. What are Feedback Amplifiers. Explain the concept of Feedback, With the help of a neat block diagram, derive the expression for gain of the voltage Series Feedback amplifier.

An amplifier has a bandwidth of 200kHz, and voltage gain of 1000. Calculate the gain bandwidth product of the amplifier with and without feedback.

(CO4,CO5) [Application]