



# PRESIDENCY UNIVERSITY

BENGALURU

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## Mid - Term Examinations - March 2026

Date: 12-03-2026

Time: 02:00pm - 03:30pm

<b>School:</b> SOE	<b>Program:</b> B. Tech		
<b>Course Code :</b> ECE2507	<b>Course Name:</b> Micro Electronics		
<b>Semester:</b> IV	<b>Max Marks:</b> 50	<b>Weightage:</b> 25%	

CO - Levels	C01	C02	C03	C04	C05
Marks	26	24			

### Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.

### Part A

Answer ALL the Questions. Each question carries 2marks.

5Q x

2M=10M

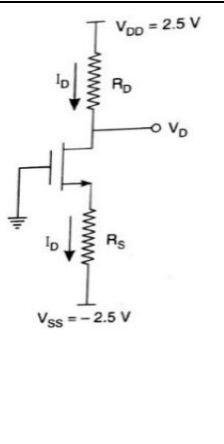
1	A MOSFET semiconductor device used for switching or amplifying signals due to its low power consumption, high speed, and small size. Define a MOSFET. Give reason for the use as voltage-controlled device.	2 Marks	L1	C01
2	MOSFET is a type of FET, most commonly fabricated by the controlled oxidation of silicon. Define the threshold voltage in enhancement type MOSFET with its significance.	2 Marks	L1	C01
3	MOSFET is an insulated gate semiconductor device, widely utilized in digital circuits, power supplies and inverters. If an NMOS device has $\mu_n C_{OX} = 100 \mu A/V^2$ , $W=10 \mu m$ and $L=1 \mu m$ , find the value of drain current when $V_{DS} = 0.9V$ .	2 Marks	L1	C01
4	When an operational amplifier is combined with an amplification circuit, it can amplify weak signals to strong signals. Define differential mode and common mode gain?	2 Marks	L1	C02

5	Op-AMPs are linear devices that have all the properties required for nearly ideal DC amplification and are therefore used extensively in signal conditioning and filtering. Find the output of an open-loop differential amplifier if $V_{in1} = 3.2 \text{ mV}$ , $V_{in2} = 3.0 \text{ mV}$ , and $A = 1.5 \times 10^5$ .	2 Marks	L2	CO2
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**Part B**

**Answer the Questions.**

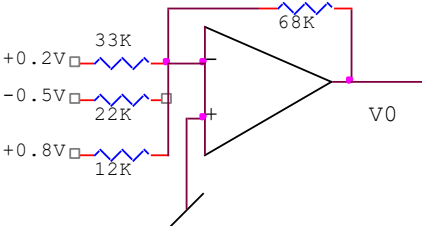
**Total Marks 40M**

6.	a.	A MOSFET is a voltage-controlled semiconductor device widely used for switching and amplification in electronic circuits. Compare MOSFET and BJT in detail. Explain the device structure and physical operation of an n-channel Enhancement type MOSFET with neat diagrams. Why Enhancement type MOSFET are called as Normally OFF MOSFET.	10 Marks	L2	CO1	
	b.	MOSFET circuits is based on three possible operating modes: cutoff, triode (aka linear), and saturation. The MOSFET current equation varies depending on the operating region. Design the circuit as shown in figure such that the transistor operates at $I_d = 0.4 \text{ mA}$ and $V_D = +0.5 \text{ V}$ . The NMOS transistor has $V_t = 0.7 \text{ V}$ , $\mu_n \cdot C_{ox} = 100 \mu\text{A}/\text{V}^2$ , $L = 1 \mu\text{m}$ and $W = 32 \mu\text{m}$ . $V_{DD} = \pm 2.5 \text{ V}$ .		10 Marks	L2	CO1

**Or**

7.	a.	MOSFET is an excellent choice for small signal linear amplifiers as their input impedance is extremely high making them easy to bias. Derive the expression for Input Resistance ( $R_i$ ), Output Resistance ( $R_o$ ), Open Circuit Voltage gain ( $A_{vo}$ ) and Overall Voltage Gain ( $A_{vs}$ ) for Common source Amplifier.	10 Marks	L3	CO1
	b.	MOSFETS pass electric current through a conductive region or path called channel. We can make this conductive channel wider or smaller by applying a suitable gate potential. Derive the expression for channel length modulation for MOSFET	10 Marks	L2	CO1

8.	a.	An operational amplifier is a voltage amplifying device designed to be used with external feedback components such as resistors and capacitors between its output and input terminals to perform various operations.  Derive the expression for NINV Adder using OPAMP	10 Marks	L1	CO2
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	b.	<p>Op amps can be used as inverting amplifiers to provide a stable, linear relationship between input and output. Find the output voltage of the following OPAMP circuit shown in figure.</p> 	10 Marks	L2	CO2
<b>Or</b>					
9.	a.	<p>OP-AMPS are available in the form of an IC, and are widely available, with countless selectable performance levels to meet every application. Derive the expression for Differentiator and Integrator using op-amp.</p>	10 Marks	L2	CO2
	b.	<p>An OP-AMP is derived from the fact that it is intended for use in a feedback loop whose feedback properties determine the feed-forward characteristics of the amplifier and loop combination.</p> <p>Design an adder circuit using op-AMP for</p> $V_o = -(0.1V_1 + V_2 + 0.1 + 10V_3)$	10 Marks	L3	CO2