COEP TECHNOLOGICAL UNIVERSITY (COEP Tech)

A Unitary Public University of Government of Maharashtra
(Formerly College of Engineering Pune (COEP))

END Semester Examination

Programme: FY B. Tech **Semester: I**

Course Code:ETC-23001 **Course Name: Elements of Electronics Engineering**

Branches: Electrical, E & TC and Instrumentation and Control

Academic Year: 2024-25

Duration: 2hr **Max Marks: 50**

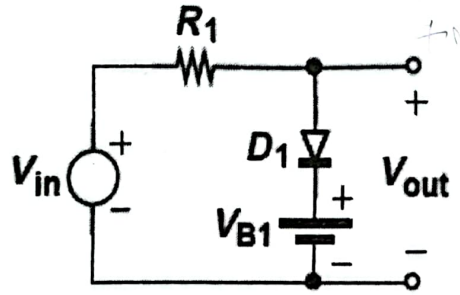
Student PRN No.

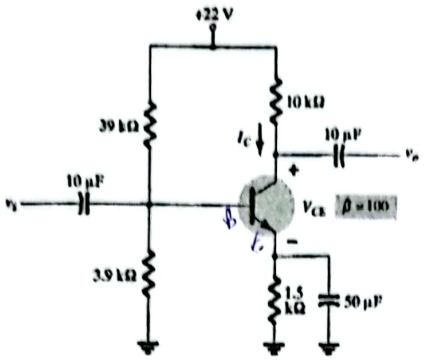
6	1	2	4	0	7	1	1	1

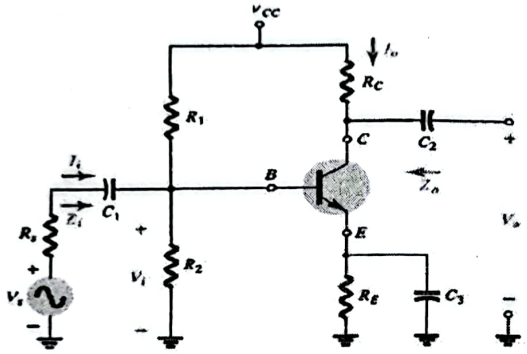
Instructions:

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of stationery, calculator etc. not allowed.
5. Write your PRN Number on Question Paper.

			Marks	CO	PO
Q1	a	Conductivity of semiconductors depends on which parameters? How does conductivity of semiconductors and conductors behave with rise in temperature?	3	1	1
	b	Given the following continuity equation for n-type semiconductor cubical volume, $$\frac{\partial p_n}{\partial t} = -\frac{p_n - p_{no}}{\tau_p} + D_p \frac{\partial^2 p_n}{\partial x^2} - \mu_p \frac{\partial (p_n \varepsilon)}{\partial x}$$ where, p_n is average hole concentration at time t in a cubical volume of surface area A and length dx, p_{no} is equilibrium concentration of holes, τ_p is mean lifetime of holes, D_p is diffusion constant, μ_p is hole mobility and ε is applied electric field. Obtain average hole concentration with respect to either time or space in the n-type semiconductor material, if the following two scenarios are given: i) The average hole concentration is independent of spatial position x and applied electric field $\varepsilon = 0$ ii) The average hole concentration is independent of time t and applied electric field $\varepsilon = 0$	4	2	1

	c	Draw the energy band diagram of n-type semiconductor material superimposed by the Fermi function. Show the Fermi level in the diagram. Compare and comment on the Fermi levels of n-type semiconductors and intrinsic semiconductor.	3	1	2
Q2	a	An AC voltage of peak value 20 V is connected in series with a silicon diode and load resistance of 500 Ω. If the forward resistance of diode is 10 Ω, find peak current through diode peak output voltage What will be these values if the diode is assumed to be ideal?	3	4	3
	b	For the center taped transformer-based bridge rectifier circuit, a capacitor is connected at the output .Draw and explain the circuit diagram and the input output waveforms	4	4	1
	c	Identify and name the following circuit and sketch the output waveform of the given circuit. 	3	4	3
Q3	a	With the help of circuit diagram and characteristics of BJT in Common Emitter configuration, explain the working of transistor as an amplifier. Show different regions of operations and clearly mention the region of operation for amplifier circuits.	5	3	1
	b	What is Miller Effect? What is the significance of of Miller Capacitance ? Elaborate with the help of proper circuit diagram.	3	3	2
	c	Draw the circuit diagram of BJT amplifier circuit. Show various capacitors connected in the circuit and explain the use of bypass capacitors for ac analysis of the circuit.	2	3	1
Q4	a	A silicon npn transistor biased in voltage divider arrangement as shown in the circuit diagram . If the beta value of the given transistor is 100 ,the applied biasing voltage is 22V, resistors 39KΩ and 3.9KΩ are connected in the voltage divider biased arrangement and values of resistors connected to collector and emitter are 10KΩ and 1.5KΩ respectively. Calculate V_{CE}, I_B and Ic. Draw dc load line and locate Q point on DC Load Line using exact analysis.	7	3	3



	b	For the transistor circuit as shown in the figure below, draw re equivalent. Clearly indicate input and output impedances for the given circuit. 	3	3	1
Q5	a	Get the Boolean Expression of the following truth table using SOP and POS form	5	5	1

	A	B	C	Y
0	0	0	0	0
1	0	0	1	1
2	0	1	0	0
3	0	1	1	1
4	1	0	0	0
5	1	0	1	1
6	1	1	0	0
7	1	1	1	0

	b	Solve the following truth table with a K Map	3	5	1

	C	B	A	Y
m_0	0	0	0	X
m_1	0	0	1	1
m_2	0	1	0	1
m_3	0	1	1	X
m_4	1	0	0	0
m_5	1	0	1	0
m_6	1	1	0	0
m_7	1	1	1	1

	c	Implement the Boolean expression F (A, B, C) = $\sum$ m (0, 1, 3, 5, 7) using one 8:1 multiplexer.	2	5	1