

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Backlog), November 2018

B. Tech in ECE Engineering, Semester III

Roll No.....

COURSE CODE: COURSE TITLE: ECE301

Time: 3 hours

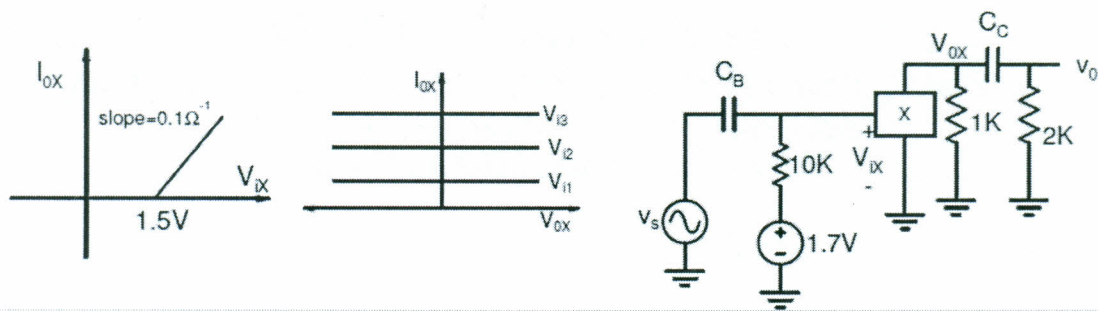
Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A	Objective type multiple choice questions (10 questions @ 1 mark)	10
i.	If E_F denotes Fermi Energy, the probability of occupancy of electrons at E_F at any temperature is (A)25% (B)50% (C) 75% (D)100%	
ii.	When semiconductor is doped with impurities following change occurs (A)Mobility increases (B) Resistivity increases (C) Conductivity Increases (D) All of above	
iii.	If N_D and N_A are the donor and acceptor concentrations respectively then net impurity concentration is (A) $N_D \sim N_A$ (B) N_D / N_A (C) $N_D * N_A$ (D) None of above	
iv.	Mobility of charge carriers has units $m/V.s^2$ (B) $mV./s$ (C) $m^2/V.s$ (D) $m. s / V$	
v.	A highly doped layer is buried in the substrate during fabrication of BJT so as to (A) increase the resistance of collector (B) increase the conductance of base (C) decrease the resistance of collector (D) decrease recombination in base	
vi	The common base gain of BJT IS 0.98, then the common emitter gain will be (A)0.49 (B) 4.9(C) 49 (D) 490	
vii	The trans conductance of MOSFET g_m can be increased by (A)Decreasing aspect ratio (B) increasing drain current I_D (C) decreasing overdrive V_{GT} (D) increasing output resistance	
viii	A diode has forward current of $2\mu A$ flowing through it. The small signal diode resistance r_D is (A)1.3 K Ω (B)13 K Ω (C)130 K Ω (D)130 Ω	
ix	The BJT configuration which can be used as buffer is (A) Common Base (B)Common Emitter (C) Common Collector (d) none of above	
x	The Darlington amplifier has following properties (a) Very high current gain (b) High Input resistance (c) Low output resistance (d) all of above.	

Q.2	Short answer type questions (4 questions @ 2.5 marks)	10
(a)	What is Early effect? How does it affect the collector current of BJT?	
(b)	Compare the advantages of BJT over MOSFET?	
(c)	Why is biasing done for amplifiers?	
(d)	Draw the frequency response of common emitter amplifier.	
Q.3A	Explain how an Intrinsic semiconductor can be made intrinsic ?	05
Q.3B	Define mobility of electrons. What are the factors that effect mobility of carriers in semiconductor?	05
Q.4A	Derive the expression for built in potential for pn junction (diode).	05
Q.4B	Consider a pn junction with $N_A=2 \times 10^{16} \text{ cm}^{-3}$ and $N_D= 5 \times 10^{15} \text{ cm}^{-3}$. Determine the built-in potential assuming intrinsic carrier concentration for Si is $1.5 \times 10^{10} \text{ cm}^{-3}$.	05
Q.5A	Draw the structural diagram of n channel MOSFET. Explain the accumulation, depletion and inversion modes of operation.	05
Q.5B	Write the equation for Drain Current I_D in saturation regions of MOSFET.	05
Q.6A	Draw the schematic diagram of Common Collector configuration.	05
Q.6B	Draw the small signal model of BJT and write the mathematical equation for trans -conductance	05
	OR	
Q.6B	Determine the voltage gain of common collector BJT using small signal model.	05
Q.7A	Draw the circuit diagram for potential divider biasing of BJT and write the relevant equations.	05
Q.7B	Draw the circuit diagram for potential divider biasing of MOSFET and write the relevant equations.	05
	OR	
Q.7B	Explain output characteristics of MOSFET, marking clearly the various regions of operation.	05
Q.8	Show the DC & AC analysis of the circuit below and write the value of total Collector Voltage and Current. The input signal is $v_s=0.2 \sin(\omega t)$.	10



Q.9A	Draw the High frequency model of BJT and explain the internal capacitances	10
Q.9B	Draw the frequency response of BJT and explain why the response degrades at lower and higher frequencies.	10
OR		
Q.9B	Explain the working of Differential Amplifier.	10