PVP 20

Code: 20EE3301, 20EC3301

II B.Tech - I Semester – Regular/Supplementary Examinations
DECEMBER 2023

ELECTRONIC DEVICES AND AMPLIFIER CIRCUITS

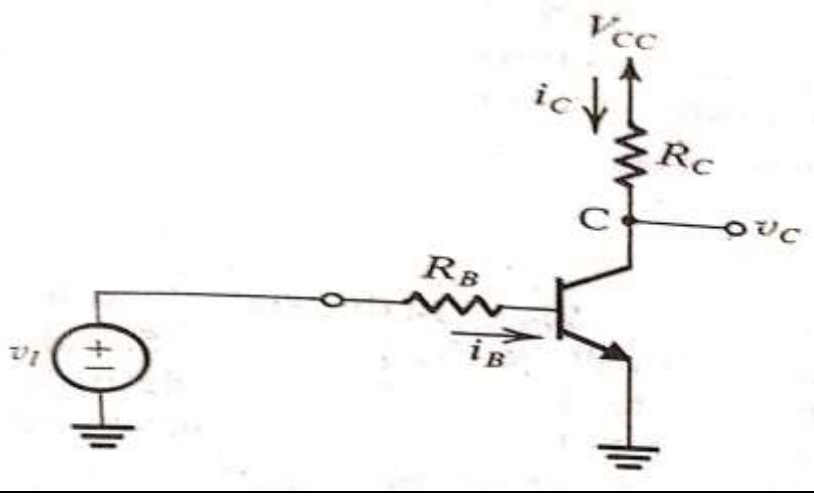
(Common for EEE, ECE)

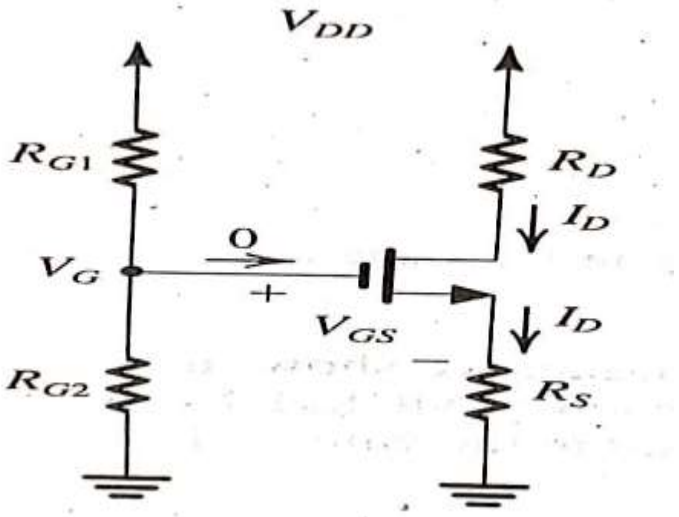
Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level CO – Course Outcome

			BL	CO	Max. Marks
		UNIT-I			
1	a)	Describe the simplified structures and modes of operation of NPN transistor.	L2	CO1	7 M
	b)	Measurement of an NPN BJT in a particular circuit has the base current to be 14.46 μA, the emitter current to be 1.460 mA and the base-emitter voltage to be 0.7 V. For these conditions, calculate α, β and I_S.	L3	CO2	7 M
		OR			
2	a)	For the circuit shown below has $V_{cc}=V_l$= + 5V, $R_B = R_C$ = 1KΩ, and β=100. Calculate the base current, the collector current, and the collector voltage. If the transistor is saturated, find β_{forced}. What value should R_B be raised to in order to bring the transistor to the edge of saturation?	L3	CO2	7 M

					
	b)	Design the circuit for implementing the current source 'I' and analyze the operation of BJT biased using a constant-current source.	L4	CO4	7 M
		UNIT-II			
3	a)	Explain the i_d-V_{ds} relationship for the NMOS transistor and also sketch the characteristics.	L4	CO1	7 M
	b)	Analyze the large signal operation and transfer characteristics of the CS Amplifier.	L4	CO2	7 M
		OR			
4	a)	It is required to design the below circuit to establish a dc drain current I_D=0.5mA.The MOSFET is specified to have V_t=1V and $k_n'W/L = 1mA/V^2$. For simplicity, neglect channel length modulation λ=0. Consider V_{DD}=15V. Calculate the percentage change in the value of I_D obtained when the MOSFET is replaced with another unit having the same $k_n'W/L$ but V_t=1.5V.	L3	CO2	7 M

					
	b)	Draw and explain the small-signal operation of MOSFET amplifier.	L3	CO2	7 M
		UNIT-III			
5	a)	Derive voltage gain, open circuit voltage gain and overall voltage gain for common gate amplifier using small signal analysis.	L3	CO3	7 M
	b)	Analyze the short-circuit current gain and unity-gain frequency for CS amplifier using hybrid-π model.	L4	CO3	7 M
		OR			
6	a)	A CS amplifier has $C_{C1} = C_S = C_{C2} = 1\mu F$, $R_G = 10M\Omega$, $R_{sig} = 100\ K\Omega$, $g_m = 2$ mA/V, $R_D = R_L = 10\ K\Omega$. Calculate $A_M, f_{P1}, , f_{P2}, , f_{P3}, f_{L.}$	L3	CO3	7 M
	b)	With the help of neat diagram explain capacitively coupled common source amplifier and sketch the frequency response including three frequency bands.	L2	CO3	7 M
		UNIT-IV			
7	a)	Obtain the Common-Mode gain and Common-mode Rejection ratio of MOS differential pair with small-signal operation.	L4	CO1	7 M

	b)	Explain the MOS differential pair operation with a differential input voltage.	L2	CO3	7 M
OR					
8	a)	Estimate the three components of the input offset voltage for the MOS differential pair having V_{OV} = 0.2V, $\Delta R_D/R_D$=2%, $\Delta(W/L)/(W/L)$ = 2% and ΔV_t = 2 mV.	L4	CO3	7 M
	b)	Illustrate the simple basic approach for differential-to-single ended conversion.	L3	CO1	7 M
UNIT-V					
9	a)	Consider a basic MOSFET constant current source circuit with V_{DD} = 3V, I_{REF} = 100µA to obtain an output current whose value is 100µA. Find R if Q_1 & Q_2 are matched & have channel length of 1µm, channel width of 10µm, V_t = 0.7V & k_n'=200µA/v^2. What is the lowest possible value of $V_{O.}$ Assume V_A' = 20 v/µm. Calculate output resistance of the current source.	L3	CO4	7 M
	b)	Analyze the MOSFET current mirror circuit and derive current transfer ratio also sketch transfer characteristics.	L4	CO4	7 M
OR					
10	a)	Differentiate the MOSFET scaling techniques.	L4	CO1	7 M
	b)	Demonstrate the operation of MOS Current-Steering Circuit with neat sketch.	L2	CO4	7 M