

Date : 30-01-23

K. J. Somaiya Institute Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Nov – Dec 2022-23 (B.Tech) Examination: SY Semester: III Course Code: EXC303 Course Name: Electronic Devices and Circuits Duration: 2.5 Hours Max. Marks: 60				
Instructions: (1) All questions are compulsory. (2) Draw neat diagrams wherever applicable. (3) Assume suitable data, if necessary.				
		Max. Marks	CO	BT level
Q 1	Solve any six questions out of eight:	12		
i)	Describe what is meant by i) Width-to-length ratio and ii) Drain-to-source saturation voltage	2	1	U
ii)	Define the saturation and no saturation bias regions for MOSFET	2	2	U
iii)	Derive Diode voltage from diode current equation.	2	3	AP
iv)	How diode can be used for temperature measurement.	2	4	U
v)	For 1 μ F capacitor find reactance at 10Hz, 100Hz, 1KHz, 10KHz, 100KHz.	2	5	AP
vi)	What is transfer function of RC high pass filter?	2	6	U
vii)	Define CMRR.	2	1	U
viii)	Define Differential gain.	2	2	U
Q.2	Solve any four questions out of six.	16		
i)	Calculate the drain current in an NMOS transistor with parameters $V_{TN} = 0.8$ V, $k'_n = 80 \mu\text{A}/\text{V}^2$, $W = 10 \mu\text{m}$, $L = 1.2 \mu\text{m}$, and with applied voltages of $V_{DS} = 0.1$ V and (a) $V_{GS} = 0$, (b) $V_{GS} = 1$ V, (c) $V_{GS} = 2$ V, and (d) $V_{GS} = 3$ V.	4	1	U
ii)	The transistor characteristics i_D versus v_{DS} for an NMOS device is shown in Figure. (a) Is this an enhancement-mode or depletion-mode device? (b) Determine the values for K_n and V_{TN} . (c) Determine $i_D(\text{sat})$ for $v_{GS} = 3.5$ V and $v_{GS} = 4.5$ V.	4	2	U

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iii)	Describe the channel length modulation effect and define the parameter λ	4	4	U
iv)	Derive transfer function of RC low pass filter and draw its bode plot.	4	3	AP
v)	Explain effect of Miller capacitance.	4	6	U
vi)	Express output V_o of Differential amplifier in terms of CMRR.	4	3	AP
Q.3	Solve any two questions out of three.	16		
i)	If the voltage across a silicon diode at room temperature of 300K is $V = 0.68V$ and saturation current $I_s = 2.93 \times 10^{-9}A$ and $\eta = 2$, $V_T = 26mV$ calculate diode current.	8	1	AP
ii)	Draw magnitude response of RC coupled and Direct coupled Amplifier. Why gain for RC coupled decreases at lower and high frequency.	8	2	U
iii)	Derive for small signal gain A_v , Z_i and Z_o for circuit of common source circuit with NMOS amplifier.	8	3	AP
Q.4	Solve any two questions out of three.	16		
i)	Discuss, using the concept of a load line superimposed on the transistor characteristics, how a simple common-source circuit can amplify a time-varying signal.	8	4	U
ii)	For an n-channel MOSFET biased in the saturation region, the parameters are $K_n = 0.5 mA/V^2$, $V_{TN} = 0.8 V$, and $\lambda = 0.01 V^{-1}$, and $I_{DQ} = 0.75 mA$. Determine g_m and r_o .	8	5	AP
iii)	Explain DC load line for fixed bias MOSFET circuit. Show change Q points for case (i) Power supply changes ii) value of R_D changes	8	6	U
