VIT
Vellore Institute of Technology

Continuous Assessment Test – II

Programme Name & Branch: B.Tech, ECE

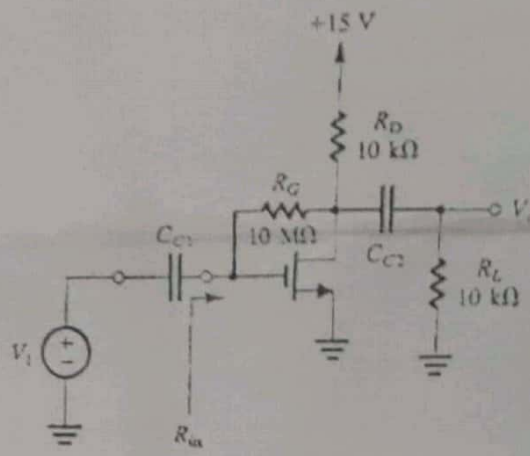
Course Name & Code: Analog Electronic Circuits-ECE 2002

Semester: Fall-2019-20 Slot: D1 Exam Duration: 90 Min Maximum Marks: 50

General instruction(s):

Assume constants whenever it is needed

Answer ALL questions

S.No.	Question	Marks
1.	Consider the amplifier in Fig.1. The MOSFET is biased at I_D = 1.06 mA and g_m = 0.725 mA/V and r_o = 47kΩ. The mid band analysis showed that V_o/V_i = -4.4V/V and R_{in} = 2.33 MΩ. Select the appropriate values for the two capacitors so that the low frequency response is dominated by a pole at 100Hz with the other pole at least a decade lower. Neglect R_G while calculating C_{C2}.  Fig.1	10
2.	In a MOSFET amplifier, R_{sig} = 100 KΩ, R_G = 100 KΩ, C_{gs} = 1 pF, C_{gd} = 0.2 pF, g_m = 3 mA/V, r_o = 50 KΩ, R_D = 8 KΩ, and R_L = 10 KΩ. Determine the expected 3-dB cutoff frequency f_H and the midband gain. If it is possible to replace the MOSFET with another having the same C_{gs} but a smaller C_{gd}, what is the maximum value that its C_{gd} can be in order to obtain an f_H of atleast 1 MHz.	10
3.	Calculate the input power, output power and efficiency for the circuit of Fig.2. The input results in a base current of 6 mA rms. find the input power dissipated by the circuit, if R_B is changed to 1.5kΩ. What maximum output power can be delivered by the circuit of Fig. 2 if R_B is changed to 1.5 k?	10

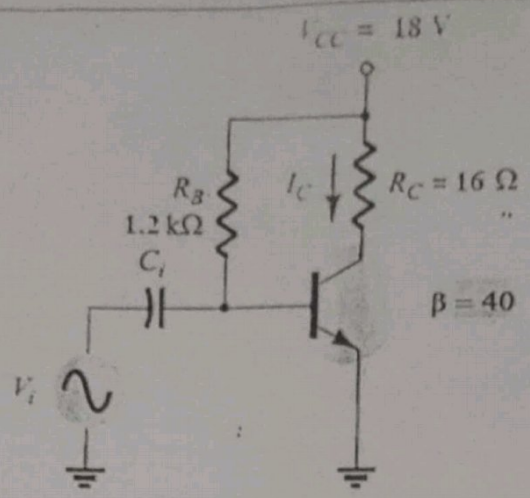


Fig.2

4.	An NMOS differential pair is biased by a current source I=0.2 mA having an output resistance R_{SS}=100 kΩ. The amplifier has drain resistances R_D=20kΩ, using transistors with $k'_n W/L = 2.5\,mA/V^2$. a) If the output is taken single-endedly, find $\|A_d\|$, $\|A_{cm}\|$ and CMRR b) If the output is taken differentially and there is a 1% mismatch between the drain resistances, find $\|A_d\|$, $\|A_{cm}\|$ and CMRR.	10
5.	Design a MOSFET differential pair which produces a differential output voltage of 2 V when (a) v_1 = -90 mV and v_2 = +90 mV (b) when one of the transistor grounded. The transistor parameters are V_{tn} = 0.8 V, k_n'(W/L) = 0.4 mA/V² and λ=0. Choose the supply voltage to be ±10V with a constant current source of 5 mA. Also determine the maximum common mode input voltage.	10