19-3-2021

BILKENT UNIVERSITY

Department of Electrical and Electronics Engineering

EEE313 Electronic Circuit Design

MidTerm Exam #1

Name and Surname: ----------

Student ID no: ----------

Section:--------

Signature:----------

Exam Duration: 120 minutes. Solve all 5 questions.

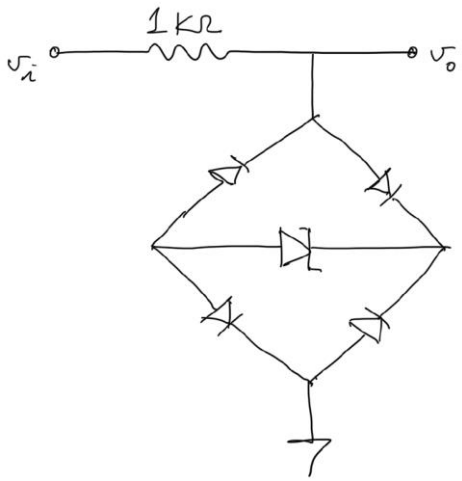
PART-1, 3 questions, 45 minutes

Question#	Your score	Out of
Q1		15
Q2		15
Q3		10
Q4		30
Q5		30
Total:		100

Instructions:

1. Calculators without extensive memory are allowed
2. Clearly explain all your answers in order to receive credit
3. Put a box around your final answer
4. Cheat sheets are not allowed
5. Indicate the units for your final answers
6. Write your student ID on the bottom of every page

Q1. (15 points)



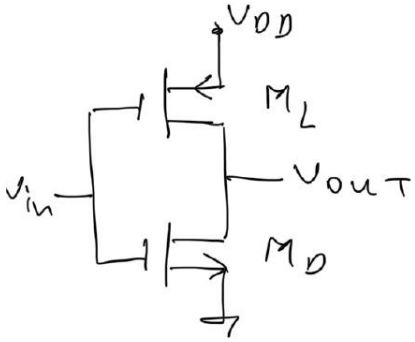
For the circuit on the left, the diodes can be represented by a piecewise-linear model with cut-in voltage V_γ = 0.65V and forward resistance r_d = 20Ω. The Zener can also be modeled by a piecewise-linear model, has an incremental resistance of r_z = 20 Ω and its voltage is 8.2V when a Zener current of 10mA is passed through it. Sketch and clearly label the v_o versus v_i transfer characteristic of the circuit, for -20V < v_i < 20V. Note: Verify your assumptions.

Q2. (15 points)

For the circuit on the left, V_{DD} = 10V, V_{TN} = 0.6V, K_n = 0.5mA/V^2

a) Assuming $\lambda = 0$, find R such that I_D = 12.5mA.
b) Assuming $\lambda = 0.02V^{-1}$, find R such that I_D = 12.5mA. In this part an approximate iterative solution is acceptable.
Note: Verify your assumptions.

Q3. (10 points)



For the circuit on the left,
V_{DD} = 5V, V_{TN} = 1V, V_{TP} = -1V, $K_n = K_p$ = 1 mA/V^2, $\lambda = 0$.
Find V_{out} for when V_{in} = 3 V.
Note: Verify your assumptions.