File: G/coursesF16/303H/303HF1Midtrm.doc RWN 11/03/16

ENEE 303H Fall 2016 – Midterm Exam Take-Home due Tu 11/08/16

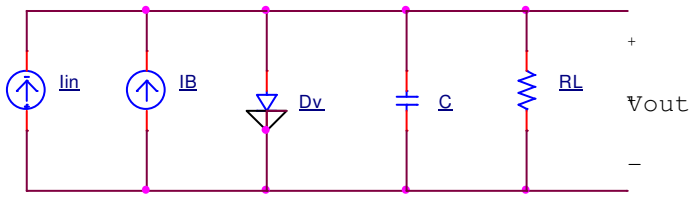
Open book open notes but not open computers; 100 points total (75 minutes);
Your signature insures that the work submitted is solely your own. Good luck

1. (100 points, 75 min)

For the following Vanadium diode circuit assume the diode, Dv, is described by

$$V = V_d + R_d(I)(I^2\text{-}10^{-6}) \quad V_d = 1V,\ R_d = 6x10^8\ V/A^3$$

and C = 20nFd. I_B = 2mA is a bias current and I_{in} is a small signal current.



a) Sketch the diode V vs. I curve for –2mA< I <+2mA giving the local maxima and minima values of V.
b) Add a load line passing through the current bias I_B =2mA point and the Q point at I=0.
c) Find the value of the load resistance, RL, to give this load line.
d) Find the small signal diode resistance r_d at the Q point.
e) Give the small signal differential equation for $V_{out}(t)$ with $I_{in}(t)$ as forcing function.
f) Give the small signal transfer function $T(s) = V_{out}/I_{in}(s)$.
g) If the small input current is $I_{in}(t)=0.001\cos(2\pi 10^{10}t)$, find the resulting output voltage, $V_{out}(t)$