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SN _____

EE 320 – Electronics I**Exam #1**

September 27, 2017

12:00-12:50 PM

100 points

Turn off and store out of sight your mobile telephone and all other electronic devices, other than your calculator. A calculator is the only electronic device you may operate during this exam. Write your name and student number where indicated above. This exam is to be an individual effort and is closed book, closed notes, and no formula sheets. Using pre-programmed equations (symbolic or otherwise) on your calculator is prohibited. Show all of your work on the supplied sheets of paper. **Do not write on the back of any sheet of paper.**

Prob. #1	Prob. #2	Prob. #3	Prob. #4	TOTAL
25	25	25	25	100 pts.

- Diodes: $i = I_s \left(e^{\frac{v}{nV_T}} - 1 \right)$, $V_T = \frac{kT}{q}$, $V_2 - V_1 = nV_T \ln \left(\frac{I_2}{I_1} \right)$,

$$r_d = \frac{nV_T}{I_D} = 1 \left/ \frac{\partial i_D}{\partial v_D} \right|_{i_D=I_D}, \quad V_Z = V_{Z0} + r_Z I_Z, \quad \Delta V_Z = r_Z \Delta I_Z$$

- Regulators: Line regulation $\equiv \frac{\Delta V_O}{\Delta V^+}$, Load regulation $\equiv \frac{\Delta V_O}{\Delta I_L}$

- Half-cycle rectifier: $V_O \approx \frac{V_s}{\pi} - \frac{V_{D0}}{2}$

- Half-cycle peak rectifier (ideal diode): $V_r \approx V_p \frac{T}{\tau}$, $i_{D\text{av}} \approx \frac{V_p}{R} \left(1 + \pi \sqrt{\frac{2V_p}{V_r}} \right)$,

$$i_{D\text{max}} \approx \frac{V_p}{R} \left(1 + 2\pi \sqrt{\frac{2V_p}{V_r}} \right), \quad \omega \Delta t \approx \sqrt{2V_r/V_p}$$

- Full-cycle rectifier: $V_O \approx \frac{2V_s}{\pi} - V_{D0}$

- Full-cycle peak rectifier (ideal diodes): $V_r \approx V_p \frac{T}{2\tau}$, $i_{D_{av}} \approx \frac{V_p}{R} \left(1 + \pi \sqrt{\frac{V_p}{2V_r}} \right)$,
 $i_{D_{max}} \approx \frac{V_p}{R} \left(1 + 2\pi \sqrt{\frac{V_p}{2V_r}} \right)$
- Bridge rectifier: $V_o \approx \frac{2V_s}{\pi} - 2V_{D0}$
- Ideal transformer: $v_s/v_p = N_2/N_1$