Homework Assignment #3

ECE 0257 – Spring 2019

Full Name

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Collaborators

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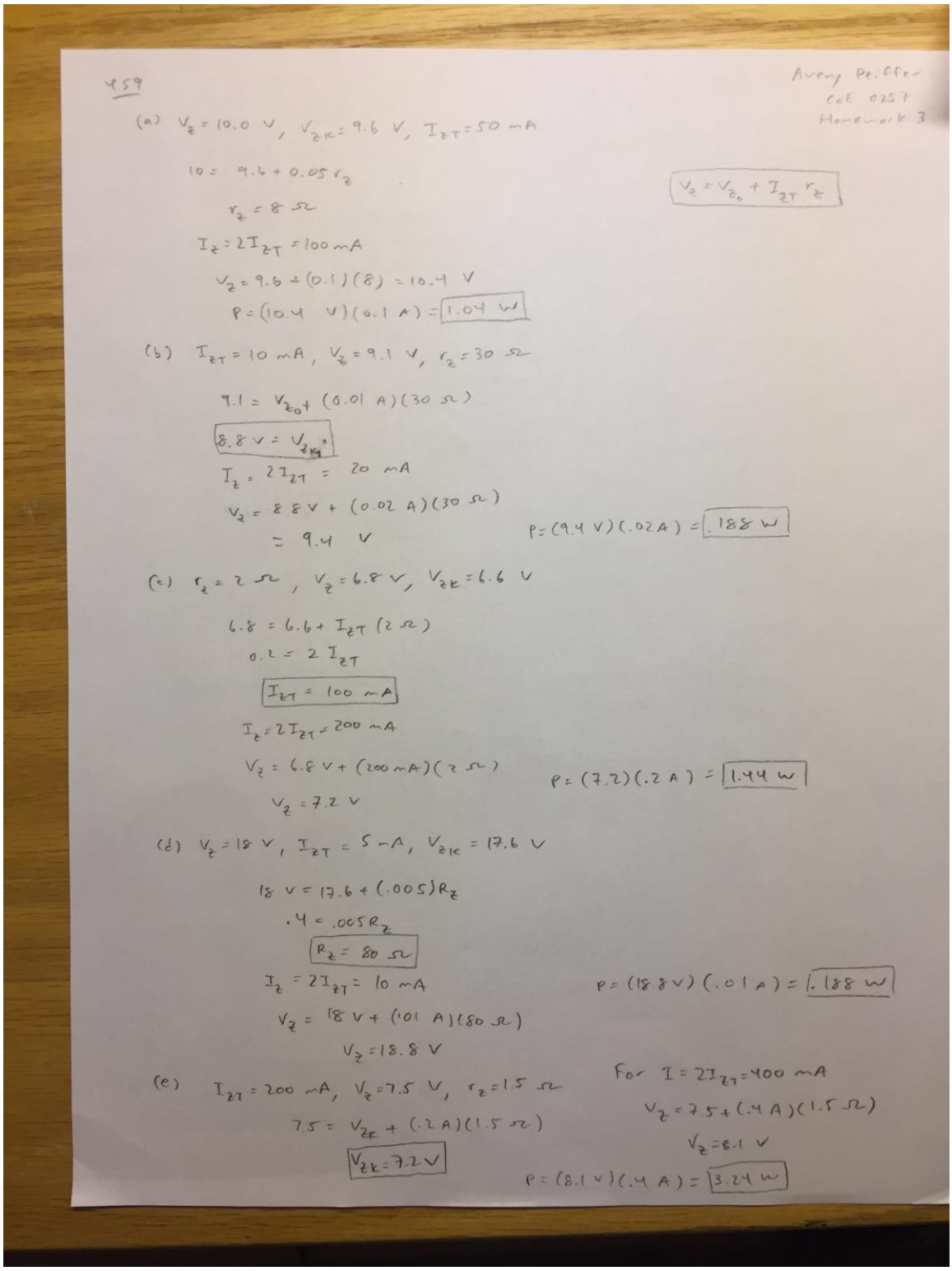
Book Problems (100 pts)

Sedra & Smith 4.59
Sedra & Smith 4.62
Sedra & Smith 4.64
Sedra & Smith 4.67
Sedra & Smith 4.72

Check-list Before Submission

- ☐ Write within boxes, no boxes are moved
- ☐ Write your full names in designated area
- ☐ Save this file as a PDF before uploading, keep the number of pages (**8**) unchanged
- ☐ Notify "TO BE CONTINUED" accordingly if you used the extra pages (page 23-26)

Sedra & Smith 4.59



4.59

Avery Peiffer
COE 0257
Homework 3

(a) $V_z = 10.0\ V$, $V_{zK} = 9.6\ V$, $I_{zT} = 50\ mA$

$10 = 9.6 + 0.05 r_z$

$V_z = V_{z_0} + I_{zT} r_z$

$r_z = 8\ \Omega$

$I_z = 2 I_{zT} = 100\ mA$

$V_z = 9.6 + (0.1)(8) = 10.4\ V$

$P = (10.4\ V)(0.1\ A) = \boxed{1.04\ W}$

(b) $I_{zT} = 10\ mA$, $V_z = 9.1\ V$, $r_z = 30\ \Omega$

$9.1 = V_{z_0} + (0.01\ A)(30\ \Omega)$

$\boxed{8.8\ V = V_{zK}}$

$I_z = 2 I_{zT} = 20\ mA$

$V_z = 8.8\ V + (0.02\ A)(30\ \Omega)$

$= 9.4\ V$

$P = (9.4\ V)(.02A) = \boxed{.188\ W}$

(c) $r_z = 2\ \Omega$, $V_z = 6.8\ V$, $V_{zK} = 6.6\ V$

$6.8 = 6.6 + I_{zT}(2\ \Omega)$

$0.2 = 2 I_{zT}$

$\boxed{I_{zT} = 100\ mA}$

$I_z = 2 I_{zT} = 200\ mA$

$V_z = 6.8\ V + (200\ mA)(2\ \Omega)$

$V_z = 7.2\ V$

$P = (7.2)(.2\ A) = \boxed{1.44\ W}$

(d) $V_z = 18\ V$, $I_{zT} = 5\ mA$, $V_{zK} = 17.6\ V$

$18\ V = 17.6 + (.005) R_z$

$.4 = .005 R_z$

$\boxed{R_z = 80\ \Omega}$

$I_z = 2 I_{zT} = 10\ mA$

$V_z = 18\ V + (.01\ A)(80\ \Omega)$

$V_z = 18.8\ V$

$P = (18.8\ V)(.01\ A) = \boxed{.188\ W}$

(e) $I_{zT} = 200\ mA$, $V_z = 7.5\ V$, $r_z = 1.5\ \Omega$

$7.5 = V_{zK} + (.2\ A)(1.5\ \Omega)$

$\boxed{V_{zK} = 7.2\ V}$

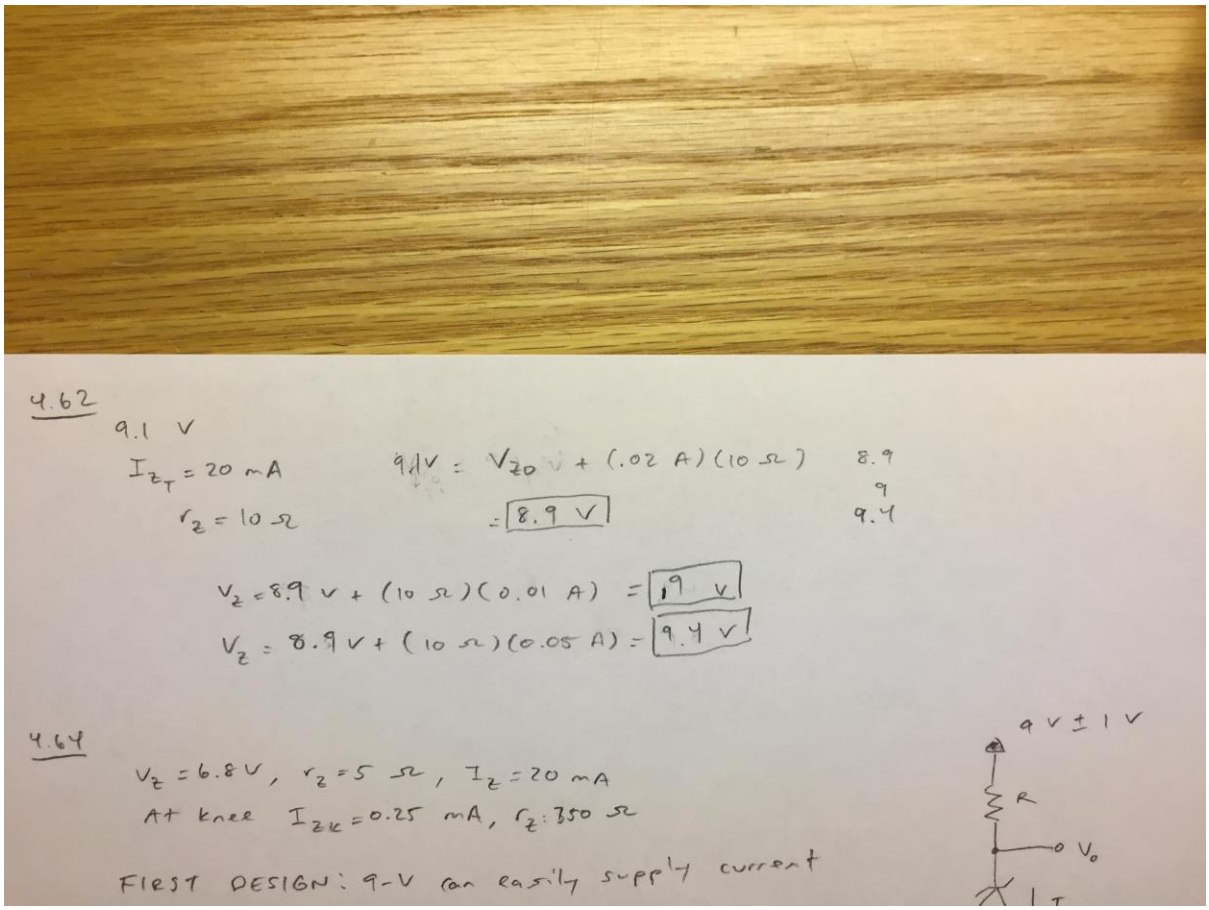
For $I = 2 I_{zT} = 400\ mA$

$V_z = 7.5 + (.4\ A)(1.5\ \Omega)$

$V_z = 8.1\ V$

$P = (8.1\ V)(.4\ A) = \boxed{3.24\ W}$

Sedra & Smith 4.62



4.62

9.1 V

$I_{Z_T} = 20\ mA$

$r_z = 10\ \Omega$

$9.1\ V = V_{Z0} + (.02\ A)(10\ \Omega)$

$= \boxed{8.9\ V}$

8.9
9
9.4

$V_z = 8.9\ V + (10\ \Omega)(0.01\ A) = \boxed{9\ V}$

$V_z = 8.9\ V + (10\ \Omega)(0.05\ A) = \boxed{9.4\ V}$

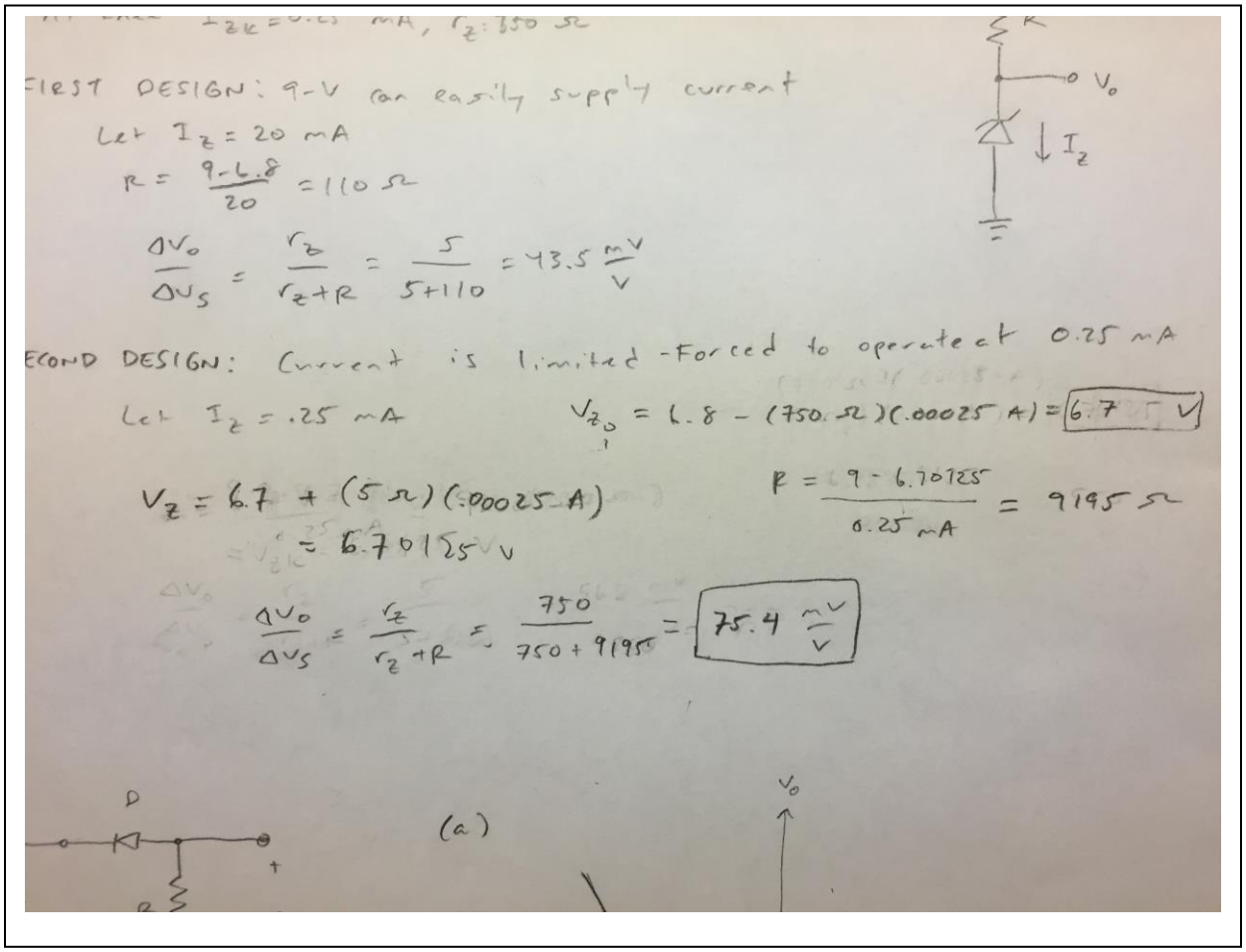
4.64

$V_z = 6.8\ V$, $r_z = 5\ \Omega$, $I_z = 20\ mA$

At knee $I_{zk} = 0.25\ mA$, $r_z = 350\ \Omega$

FIRST DESIGN: 9-V can easily supply current

Sedra & Smith 4.64



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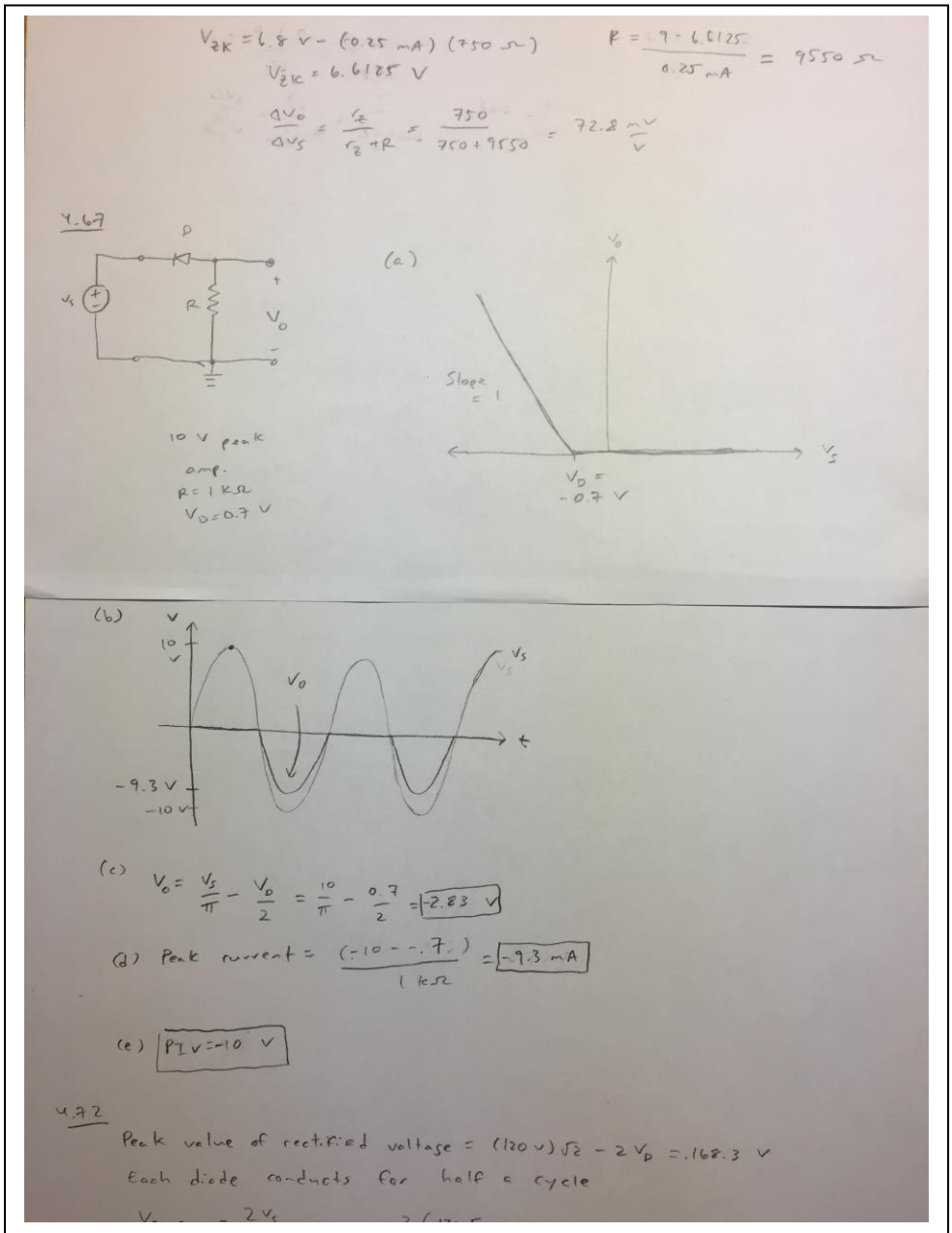

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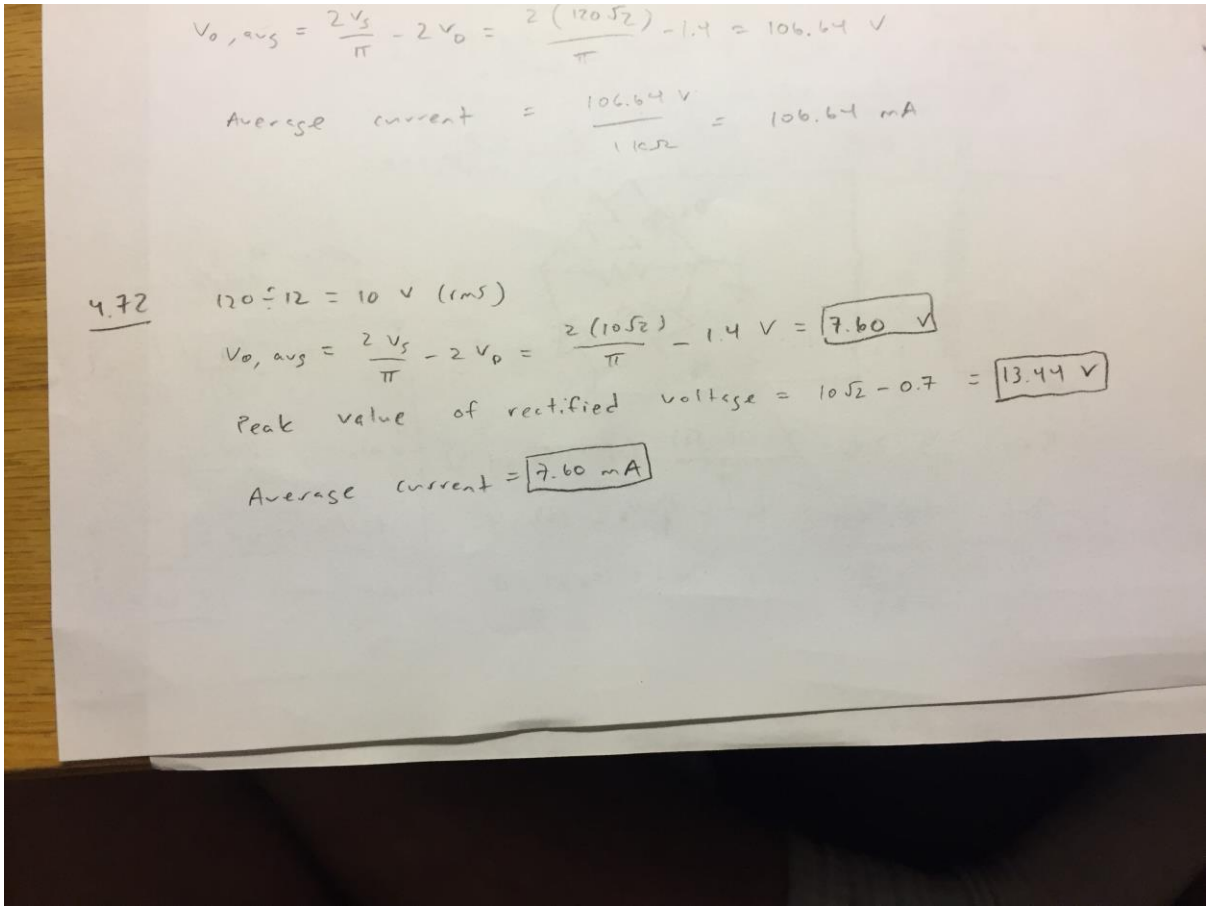

$V_{o,avg} = \frac{2V_s}{\pi} - 2V_D = \frac{2(120\sqrt{2})}{\pi} - 1.4 = 106.64\ V$

Average current $= \frac{106.64\ V}{1\ k\Omega} = 106.64\ mA$

4.72 $120 \div 12 = 10\ V\ (rms)$

$V_{o,avg} = \frac{2V_s}{\pi} - 2V_D = \frac{2(10\sqrt{2})}{\pi} - 1.4\ V = \boxed{7.60\ V}$

Peak value of rectified voltage $= 10\sqrt{2} - 0.7 = \boxed{13.44\ V}$

Average current $= \boxed{7.60\ mA}$

EXTRA PAGES

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