

**MIDTERM Solutions - Winter 2009**

<b>Q1</b>	P	10000				
	pf	0.75				
	V	240				
	(a)	S	13333.33			
		I	55.55556			
		<b>R</b>	<b>3.24</b>			
		Z	4.32			
		<b>X</b>	<b>2.85741</b>			
		Theta	0.722734	41.43063		
		pf	0.75			
	(b)	V	208			
		<b>I</b>	<b>48.1481</b>			
		<b>P</b>	<b>7511.11</b>			
		S	10014.81			
	pf	0.75				
(c)	pf	0.95				
	V	208				
	P	7511.111				
	S	7906.433				
	Qcomp	2468.783				
	Q	6624.177				
	<b>Qcap</b>	<b>4155.39</b>				
	<b>Xcap</b>	<b>10.4115</b>				
	<b>Icomp</b>	<b>38.0117</b>				
	Theta-comp	18.2041				
(d)	<b>V-I diagram</b>					
	<b>P-Q diagram</b>					
<b>Q2</b>	Ptot	21000				
	Qtot	15000				
	Stot	25806.98				
	Vline	600				
	(a)	<b>Vphase</b>	<b>346.41</b>			
		Phase	7000			
		Qphase	5000			
		Sphase	8602.325	8602.325		
		Stot	25806.98			
		<b>Iphase</b>	<b>24.8328</b>			
		<b>Iline</b>	<b>24.8328</b>	24.83277		
		Stot	25806.98			
		<b>pf</b>	<b>0.81373</b>			
		Theta	0.620249	35.5557		
	(b)	Z	13.94972			
		<b>R</b>	<b>11.3514</b>			
		<b>X</b>	<b>8.10811</b>			
		Z	13.94972			
	(c)	<b>Vphase</b>	<b>600</b>			
		<b>Iphase</b>	<b>43.0116</b>			
		<b>Iline</b>	<b>74.4983</b>			
	Sphase	25806.98				
	<b>Ptotal</b>	<b>63000</b>				
(d)	<b>Iline Delta/Y</b>	<b>3</b>				
	<b>Ptot Delta/y</b>	<b>3</b>				
	Znew	41.84915	<b>Rnew</b>	<b>34.0541</b>		
	Snew	25806.98	<b>Xnew</b>	<b>24.3243</b>		

<b>Q3</b>	S	20000	Rp	77.8	Rs	0.021
	Vp	14400	Xp	351	Xs	0.097
	Vs	240	Rcs	240		
	a	60	Xms	110		
	a*a	3600				
(a)	<b>Rep</b>	<b>153.4</b>	<b>Rcp</b>	<b>864000</b>		
	<b>Xep</b>	<b>700.2</b>	<b>Xmp</b>	<b>396000</b>		
	Zep	153.4+700.2i				
(b)	P	14000				
	pf	0.7				
	Theta	0.795399	Theta	45.59611		
	S	20000				
	Vs	240	Vp	14400		
	Is	83.33333				
	<b>Ip</b>	<b>1.38889</b>				
	Vp	14400				
	Icomplex	0.972222222222222-0.99186505951984i				
	Delta Vp	843.642803564681+528.597899869656i				
	Vpin	15243.6428035647+528.597899869656i				
	<b>Vpin,mag</b>	<b>15252.8</b>				
	Theta,in	0.034663	1.987035			
	<b>reg</b>	<b>0.05591</b>	5.591136			
(c)	Vp	14400				
	Ixm	0.036364	Irc	0.016667		
	Iexc	0.0166666666666667+0.0363636363636364i				
	Iexc, mag	0.040001	Iexc,angle	1.141034	Iexc, angle	65.4096
	<b>Pcore</b>	<b>240</b>				
	<b>Pcopper</b>	<b>295.91</b>				
	Ptot	535.9105				
	<b>eff</b>	<b>0.96313</b>	eff	96.3132		
(d)	Rsc,sec	0.05	Rsc,prim	180		
	Rep,tot	333.4	Xep,tot	700.2		
	Zep,tot	333.4+700.2i				
	Vp	14400				
	Ip,sc	7.98250053704835-16.7646876905857i				
	<b>Ip,sc</b>	<b>18.5681</b>				
	Ip,rated	1.388889				
	<b>SC ratio</b>	<b>13.369</b>				