Final 2007 Answer Key

Q1. Part A $\vec{E} = 4\times10^{13}\,\hat{i}$ [N/C]
Coordinates: (1.5 cm, 0)

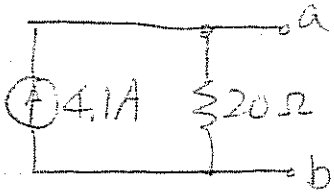
Part B i) 4)
ii) 0.141 A (cw)

Q2. Part A $V_1 = -4$ V
$V_2 = 1$ V
$I_1 = 0.5$ A
$I_2 = -0.1$ A

Part B $i = -\frac{1}{3}$ A

Q3. Part A $P_{max} = 18$ W

Part B



Q4. i) $q_1(t=0) = 3\times10^{-4}$ C
$q_2(t=0) = 3\times10^{-4}$ C
$q_3(t=0) = 2\times10^{-4}$ C
ii) $W_C(t=0) = 2.5\times10^{-3}$ J
iii) $C_{eq} = 50\ \mu$F
iv) $10^{-3}\frac{dv_C(t)}{dt} + v_C(t) = 0$
v) $\tau = 1$ ms
vi) $v_C(t) = 10e^{-10^3 t}$
vii) $i(t=0^+) = 0.5$ A
viii) $t_x = 6.9\times10^{-4}$ s

Q5. i) $R_{in_1} = \infty$ ii) $v_{D1} = 0.2$ V
iii) $v_{D2} = 0.4$ V iv) $v_{D3} = 1.6$ V
v) $v_{D4} = 2.4$ V vi) $i_F = 0.03$ mA
vii) $i_D = 0.05$ mA

Q6. $i(t) = 10\sqrt{2}\cos(377t + 20^\circ)$ A
$Q_{Load} = -340.4$ VAR
$Z_{Load} = 10\angle -20^\circ\ \Omega$
$R = 9.4\ \Omega$, $C = 780\ \mu$F