TUTORIAL ANSWERS_CAPACITOR

Question 1

3000 μC , 3×10^{-3} C

Question 2

2 μF , 2×10^{-6} F , 2×10^{6} pF

Question 3

I = CV / t = (50 μ)(10) / 0.01

I = 0.05 A

Question 4

a.) $C_T = C_1 + C_2$

$C_T = 200$ μF

b.) $Q = C_T V = (200 \mu)(20) = 4000$ μC

Question 5

$Q_1 = C_1 V = 200\mu\ (10) = 2000$ μC

$Q_2 = C_2 V = 500\mu\ (10) = 5000$ μC

$Q_T = Q_1 + Q_2 = 7000$ μC

$C_T = Q_T / V = 7000\ \mu / 10 = 700$ μF

Question 6

$C_T = C_1 // C_2 = (300\ \mu \times 600\ \mu) / (300\ \mu + 600\ \mu) = 200$ μF

Question 7

$C_T = C_1 // C_2 // C_3 = [(1/200\mu) + (1/300\mu) + (1/600\mu)]^{-1} = 100\ \mu F$

Question 8

$W = ½\ CV^2 = ½\ (5000\mu)(5^2) = 0.0625\ J$

$W = ½\ CV^2 = ½\ (5000p)(5^2) = 62.5\ nJ$

$W = ½\ CV^2 = ½\ (200\mu)(230^2) = 5.29\ J$

Question 9

a.) 33.3 µF b.) 300 µF c.) 200 µF d.) 150 µF

Question 10

a.) $C_T = 25\ \mu F$

b.) $Q = CV = (20\ \mu)(200) = 4\ mC$

c.) $V = Q / C_T = (4m) / (25\ \mu) = 160\ V$

d.) Initial $W = ½\ CV^2 = ½\ (20\mu)(200^2) = 0.40\ J$

Final $W = ½\ CV^2 = ½\ (25\mu)(160^2) = 0.32\ J$

Energy dissipated = 0.40 – 0.32 = 0.08 J

Question 11

a.) $C_T = 1.33\ \mu F$

b.) $Q = C_T V = (1.33\ \mu)(12) = 16\ \mu C$

c.) $W = ½CV^2 = ½\ (1.33\mu)(12^2) = 96\mu\ J$

Question 12

a.) $Q = CV = (10\mu)(50) = 500\ \mu C$

b.) $V = Q / C_T = (500\mu) / (30\mu) = 16.7\ V$

c.) $Q_{10uF} = CV = (10\mu)(16.7) = 167\ \mu C$

$Q_{20uF} = CV = (20\mu)(16.7) = 334\ \mu C$

d.) Initial $W = \frac{1}{2}CV^2 = \frac{1}{2}\ (10\mu)(50^2) = 0.0125\ J$

e.) Final $W = \frac{1}{2}CV^2 = \frac{1}{2}\ (30\mu)(16.7^2) = 4.18\ m\ J$

Question 13

a.) i.) $Q = CV = (200\mu)(30) = 6000\ \mu C$

ii.) $W = \frac{1}{2}\ (200\mu)(30^2) = 0.09\ J$

b.) i.) Charge

ii.) Potential difference.

c.) $W = \frac{1}{2}(Q^2 / C) = \frac{1}{2}\ (6000\mu^2) / (300\mu) = 0.06\ J$

Question 14

a.) Charge of 100 μC stored perVolt applied.

b.) $Q = CV = (100\mu)(20) = 2000\ \mu C$

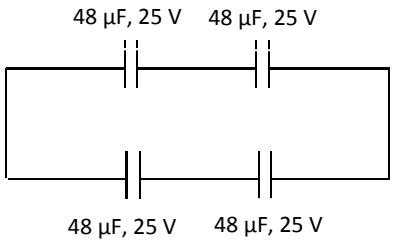
c.) 2000 μC

d.)$W = \frac{1}{2}\ (100\mu)(20^2) = 0.02\ J$

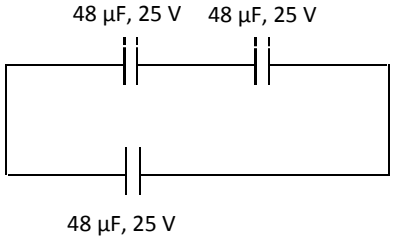
e.) If maximum voltage is exceeded, then insulation between plates may break down and allow current to flow between the plates.

Question 15

a.)

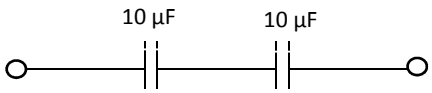


b.)

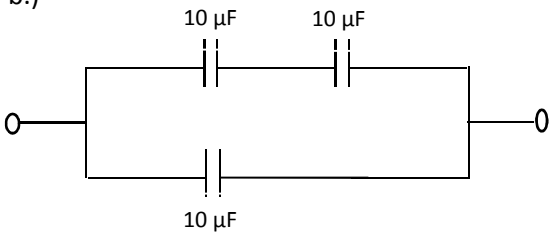


Question 16

a.)



b.)



Question 17

a.) 6 V

b.) 0 V ; since no current flow