

### Physics 1214, Midterm I: solutions

Answers to multiple choice questions: 1:A, 2:D, 3:B, 4:A.

$$\text{P1 } E = k \frac{q}{r^2} = 9 \times 10^5 \text{ V/m} \quad u = \varepsilon_0 \frac{E^2}{2} = 3.58 \text{ J/m}^3$$

$$\text{P2 } E_x = -k \frac{q_1}{a^2} - k \frac{q}{(\sqrt{2}a)^2} \cos 45^\circ = 0 \quad q = -q_1 2\sqrt{2} = 2.83 \text{ C}$$

$$\text{P3 } \bar{P} = \frac{V_{\text{rms}}^2}{R} \quad R = \frac{V_{\text{rms}}^2}{\bar{P}} = 16 \Omega$$

$$\text{P4 } V_a = k \frac{q_1}{a} + k \frac{q_2}{2a} \quad V_b = k \frac{q_1}{2a} + k \frac{q_2}{a} \quad V_a - V_b = k \frac{q_1 - q_2}{2a} = -9 \times 10^5 \text{ V}$$