Answers Exam 2019

1. $\vec{F} = -\frac{1}{4\pi\varepsilon_0}\frac{q_2 q_3 A}{(A^2+H^2)^{3/2}}\vec{i}_x + \left[-\frac{1}{4\pi\varepsilon_0}\frac{q_1 q_3}{(H+B)^2} - \frac{1}{4\pi\varepsilon_0}\frac{q_2 q_3 H}{(A^2+H^2)^{3/2}}\right]\vec{i}_y$

2. $E_x = \frac{1}{4\pi\varepsilon_0}\frac{Q}{a}\left(\frac{1}{((S-a)^2+T^2)^{1/2}} - \frac{1}{(S^2+T^2)^{1/2}}\right)$

$E_y = -\frac{1}{4\pi\varepsilon_0}\frac{Q}{aT}\left(\frac{S-a}{((S-a)^2+T^2)^{1/2}} - \frac{S}{(S^2+T^2)^{1/2}}\right)$

3. a) $V(c,d) - V(a,b) = -\left[\frac{\alpha(c^4-a^4)}{4} + \frac{\beta}{2}(d^2-b^2)\right]$

b) $V(3R,0) - V(0,0) = -\frac{2\alpha}{3R}$

4. $\Phi_{front} = 0$

$\Phi_{back} = 0$

$\Phi_{bottom} = 0$

$\Phi_{left} = 0$

$\Phi_{right} = \alpha W H L$

$\Phi_{top} = \beta H W \frac{L^2}{2}$

$\frac{\alpha}{\beta} = -\frac{L}{2}$