PHYS 205-Section 03
Midterm Exam
Time: 120 min

Instructions

1. This is a closed book exam. You are not allowed to use any resources (formula sheet or any electronic devices, including smart wearables).
2. Please turn OFF all your electronic devices and place them in your bag.
3. You can only use non-programmable calculators. Make sure the memory of your calculator is erased. You can't use your cell phone as a calculator or borrow a calculator from another student.
4. Do not write on the question sheet. Your answers should be provided in the answer booklets provided to you.
5. Use proper notation and describe your work clearly. Provide proper units for your final answer.
6. If you use any formula which is not given in the formula sheet, you should show how it is derived.
7. Upon completing the exam, return BOTH the exam sheet and answer sheet.
8. We have no tolerance for any kind of plagiarism (talking, looking at somebody else's exam sheet,…).

Formula you may need

$e = 1.6 \times 10^{-19}\ C$ $\quad 1\ m\ (mili) = 10^{-3}$ $\quad 1\ \mu = 10^{-6}$

$\vec{F} = k_e \frac{qQ}{r^2}\hat{r}$ $\quad \vec{E} = \frac{\vec{F}}{q}$ $\quad k_e = 9 \times 10^9\ \frac{Nm^2}{C^2}$

$\epsilon_0 = 8.85 \times 10^{-12}\ \frac{C^2}{Nm^2}$ $\quad K = \frac{1}{2}mv^2$ $\quad V = -\int \vec{E}.d\vec{s}$

$V = \sum k_e \frac{Q}{r}$ $\quad \Delta V = \frac{\Delta U}{q}$ $\quad \phi_E = \int \vec{E}.d\vec{A} = \frac{q_{in}}{\epsilon_0}$

$C = \frac{Q}{\Delta V}$ $\quad C = k\epsilon_0 \frac{A}{d}$ $\quad U_E = \frac{Q^2}{2C}$

$\Delta V = IR$ $\quad R = \rho\ \frac{l}{A}$ $\quad P = \Delta V I$ (P = power)

Capacitors in parallel: $C_{eq} = C_1 + C_2$ in series: $C_{eq} = \frac{1}{C_1} + \frac{1}{C_2}$

Resistors in parallel: $R_{eq} = \frac{1}{R_1} + \frac{1}{R_2}$ in series: $R_{eq} = R_1 + R_2$

$q(t) = Q_{max}\left(1 - e^{-\frac{t}{\tau}}\right)$ $\quad I(t) = I_{max}e^{-\frac{t}{\tau}}$ $\quad \tau = RC$

$q(t) = Q_{max}e^{-\frac{t}{\tau}}$ $\quad I(t) = -\frac{Q_{max}}{RC}e^{-\frac{t}{\tau}}$