Name: **Student ID Number:**

Physics 121: Final Exam

March 22, 2012

- Be sure to write your name at the top of each page
- Calculators are allowed/encouraged, but of course with no "cheat sheet" programmed in
- Show your reasoning, write formulas where appropriate
- If you miss one part of the short answer, but need the number for the next part, make up a number and proceed

Formula List:

- $\sigma = \epsilon E$; E and σ in N m^{-2}, or Pa
- $\epsilon \equiv \frac{\delta L}{L}$
- $y_{\max} = \frac{mgL^3}{3EI}$; end-loaded cantilever beam
- $y_{\max} = \frac{mgL^3}{8EI}$; self-weighted cantilever beam
- $y_{\max} = \frac{mgL^3}{48EI}$; center–loaded simply-supported beam
- $y_{\max} = \frac{5mgL^3}{384EI}$; self-weighted simply-supported beam
- $I = \int\int (y - y_c)^2 dxdy$; where bending is in y-direction; y_c is centroid y-value
- $I = \frac{ab^3}{12}$ for rectangular geometry; $I = \frac{\pi R^4}{4}$ for circular geometry
- $P = \epsilon A \sigma T^4$; A in m^2; $\sigma = 5.67 \times 10^{-8}$ W/m^2/°K^4; T in Kelvin
- $P \approx 4\epsilon A \sigma T^3 \Delta T$ for radiation equilibrium and small ΔT
- $P = \kappa A \Delta T / t$; κ in W m^{-1} K^{-1}
- $P = hA\Delta T$; h in W m^{-2} K^{-1}
- T(°K) = T(°C) + 273
- $\frac{1}{?_1} + \frac{1}{?_2} = \frac{1}{?} = (n-1)\left(\frac{1}{?_1} - \frac{1}{?_2}\right)$
- $\tau = RC$; τ is in seconds if R in Ω and C in F; initial slope hits axis in time, τ.