



Physics 331 Second Exam
Second Semester 2017/2018
Instructor: Abdallah Sayyed-Ahmad

Thursday 17/5/2018

Time:90 minutes

- (1) A conducting spherical shell of radius R and zero thickness is held at a potential $V = V_0 \cos^2 \theta$. Determine the potential produced by the sphere everywhere. (25pts)

- (2) A thick spherical shell of inner radius a and outer radius b made of a dielectric material with a frozen-in polarization $\vec{P}(\vec{r}) = k \frac{\hat{r}}{r}$. Determine:
 - (a) The surface and volume bound-charge densities (10pts).
 - (b) The total bound charge (5 pts).
 - (c) Displacement vector everywhere (5 pts).
 - (d) Electric field everywhere (5 pts).

- (3) Charge density $\sigma = \sigma_0 \sin \phi$ is glued over the surface of an infinite cylinder of radius R . Find the potential inside and outside the cylinder (25pts)

- (4) Calculate the electric dipole moment of a circular ring of radius R with linear charge density $\lambda(\phi) = \lambda_0 \cos \phi$. (15 pts)