OBSERVATIONAL COSMOLOGY

PROBLEM SHEET 7 - 13/07/2017

1) You can design your own redshift survey, but the telescope allocation committee just gave access to you for 2 calendar years. You need $\Delta t = 2\left(\frac{n}{1\mathrm{Mpc}^{-3}}\right)^{1/2}$ hours of integration time to get a galaxy spectrum (fainter galaxies are more abundant than brighter galaxies but longer integration time is needed to take their spectra), where n is the average galaxy density, and your multifiber spectrograph can handle 100 fibers simultaneously. You can choose to sample only a random fraction of the galaxies $n_{obs} = \epsilon \cdot n$, ϵ being the sampling rate. Assume that you will survey a cubic region of space at $z \sim 0$ with volume L^3. You are interested in the mean power in the bin $0.08 < k < 0.12\,h\,\mathrm{Mpc}^{-1}$; assuming a Gaussian density field, choose the target density n, the sampling rate ϵ and the survey size L that optimize the measure of the galaxy power spectrum in the selected wavenumber interval.