

## Topics in test 1

1. Wave parameters ( $\eta$ ,  $\beta$  or  $k$ ,  $\vec{S}_{\text{ave}}$ ), reflection & refraction of EM wave (Snell's law,  $\theta_B$ , TE & TM polarization); photon energy,  $\Delta\lambda$ ,  $\Delta\nu$ .
2. Diffraction (divergence angle), condition for constructive / destructive interference, applications.
3. Polarization and devices (polarizer, rotator,  $\lambda/4$  plate,  $\lambda/2$  plate), anisotropic media, inhomogeneous media, nonlinear media.
4. Fiber parameters: NA,  $\alpha_m$ ,  $\Delta$ , power coupling, single mode condition, V, # of modes (M),  $\lambda_c$ .
5. Dispersion and data rate ( $R_b$ ):  $D_{\text{modal}}$ ,  $D_{\text{intra}}$ , D for DSF, dispersion compensation,  $S_0$ ,  $\lambda_0$ , PMD.
6. Fiber attenuation and power calculation ( $P_{\text{TX}}$ ,  $P_{\text{RX}}$ ) in dBm.
7. Nonlinear effects:  $\chi^{(3)}$ , FWM, SBS, SRS, nonlinear refraction (SPM, XPM).
8. Soliton: Cancellation of  $D_{\text{intra}}$  and SPM, conditions for soliton formation.