1. Explain shortly diversity methods

2. Explain the two reasons why 3. order intermodulation products are much more difficult to handle than 2. order intermodulation products for receiver.

3. Using the values given in Figure 1, calculate the noise power at the receiver output, after the 2. amplifier. If the cable loss increases 2 dB ( from 4 -> 6 dB ), is it possible to compensate by changing parameters of amplifiers? What would be new values of those parameters?

![Figure 1. Receiver structure](image)

4. Calculate the EIRP at each antenna for the DAS (Distributed Antenna System) given below. The power level at the transmitter is 30 dBm. The manufacturer of the feeder (1/2") promises a loss of 6.0 dB/100m at the carrier frequency. Gain of antenna 1 = 1 dBi, and for antenna 2, 3 and 4 Gain = 2 dBi.

![Antenna System Diagram](image)

5. Explain following figure. What kind of systems are behind those curves and what are the main differences between those systems? Explain structure principles of those systems.

![Normalized Output SNR vs branches](image)

NOTE: Formulas are in the following page if you need them.
Some (more or less) useful equations for FLT-45106 exam:

\[ G_a = \frac{P_a}{P_1}, G_e = \frac{P_a}{P_2}, P_a = G_e G_s G_c, \quad v_n = \sqrt{\frac{4hfBR}{e^{\gamma/R} - 1}} \]

\[ P_e = P_a P_2, P_s = G_e G_s G_c, \quad P_1 = \frac{P_e}{P_s}, P_2 = \frac{P_e}{P_s} \]

\[ \log_{10} \frac{P_a}{P_1} = \log_{10} G_e + \log_{10} G_s + \log_{10} G_c \]

\[ A_i = \int \mu I(z) e^{-j\beta r} \frac{d^2}{dz^2} e^{j\beta r} \frac{d^2}{dz^2} \frac{d^2}{dz^2} \cdot \frac{1}{4\pi r} \]

\[ 10 \log_{10} \frac{P_a}{P_s} - \lambda = \frac{c}{\lambda} \]

\[ Y = P_1 = \frac{P_2}{P_1}, T_1 + T_2 > 1, \quad 2f_1 - f_2, \quad 2f_2 - f_1 \]

\[ F(\theta, \phi) = g(\theta, \phi) \cdot f(\theta, \phi) \]

\[ R = 0.62 \sqrt{\frac{V}{\lambda}} \]

\[ \text{div} \mathbf{D}(r, t) = \rho(r, t) \]

\[ \text{div} \mathbf{B}(r, t) = 0 \]

\[ \text{curl} \mathbf{E}(r, t) = -\frac{\partial \mathbf{B}(r, t)}{\partial t} \]

\[ \text{curl} \mathbf{H}(r, t) = \frac{\partial \mathbf{D}(r, t)}{\partial t} + J(r, t) \]

\[ F(\text{SSL}) = 20 \log_{10} \frac{F(\max)}{F(\text{SSL})} \]

\[ F(\theta, \phi) = g(\theta, \phi) \cdot f(\theta, \phi) \]

\[ T_s = T_o (F - 1) \Rightarrow F = 1 + \frac{T_s}{T_o} \]

\[ D = \frac{U_{\text{max}}}{U_{\text{max}}} \quad \varepsilon_r = \frac{P}{P_m} \quad G = \varepsilon_r D \quad U = \frac{dP}{d\Omega} \]

\[ \text{NF} = 10 \log(f) \]

\[ \gamma = \gamma_o \Rightarrow \gamma_o \geq 0 \]

\[ p(\gamma) = \gamma_0 \quad \gamma_0 \geq 0 \]

\[ P(\gamma) = \Pr[\Gamma \leq \gamma] = \Pr[\max \{\Gamma_1 \leq \gamma\}] \]

\[ = \Pr[\Gamma_1, \Gamma_2, \ldots, \Gamma_M \leq \gamma] = \prod_{i=1}^{M} P_i(\gamma_i) \]