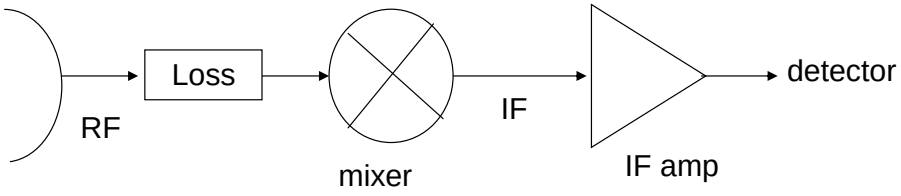
Satellite Communications Tutorial sheet

Question 1



(a) Given the following information, determine the overall noise figure for the receiver including the antenna.

Antenna noise temperature = 180K
Feeder loss = 3 dB
Mixer conversion loss = 6 dB
IF preamp – gain = 50 dB, Noise figure = 4 dB

Question 2

Given the following information about a satellite communication link, determine the transmitter power required for the earth station.
Earth station: G_e = 56 dB; T_e = 70K
Satellite : G_s = 25 dB; P_s = 10 W; T_s = 1420K
Overall: Path losses – uplink = 202 dB, down link = 200 dB
Bandwidth = 6 MHz
Operating margin = 3 dB
C/N = 22 dB
k = 1.38 x 10^{-23} J/K

Question 3

A satellite is orbiting the planet Jupiter at a distance of 9.4 x 108 km from the Earth. Using the data given below, estimate the signal to noise ratio at the receiver.

(i) Spacecraft
Transmit frequency = 2295 MHz
Transmit antenna gain = 20 dB
Transmitter output power = 30 W
(ii) Ground station
Antenna diameter = 64 m
Antenna aperture efficiency = 56 %
Receiver noise temperature = 25 K
Receiver noise bandwidth = 100 Hz