KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF ELECTRICAL ENGINEERING

EE 672 SATELLITE COMMUNICATIONS

HOME WORK # 4

1) A C-band earth station has an antenna with a transmit gain of 54 dB. The transmitter output power is set to 100 W at a frequency of 6.1 GHz. The signal is received by a satellite at a distance of 37500 km by an antenna with a gain of 26 dB. The signal is then routed to a transponder with a noise temperature of 500 K, a bandwidth of 36 MHz, and a gain of 110 dB.
   a) Calculate the path loss at 6.1 GHz.
   b) Calculate the power at the satellite antenna in dBW.
   c) Calculate the noise power at the transponder input in dBW, in a bandwidth 36 GHz.
   d) Calculate the C/N ratio, in dB, in the transponder.

2) A geostationary satellite carries a transponder with a 20 W transmitter at 4 GHz. The transmitter is operated at an output power of 10 W and drives an antenna with a gain of 30 dB. An earth station is at the center of coverage zone of the satellite, at a range of 38500 km, using dB for all calculations, find:
   a) The flux density at the earth station in dB/m2.
   b) The power received by an antenna with a gain of 39 dB, in dBW.
   c) The EIRP of the transponder in dBW.

3) A satellite in geostationary orbit is at a distance of 39000 kmfrom an earth station. The required power flux density at the satellite to saturate one transponder at a frequency of 14.3 GHz is -90.0 dBW/m2. The earth station has a transmitting antenna with a gain of 52 dB at 14.3 GHz. Find:
   a) The EIRP of the earth station.
   b) The output power of the earth station transmitter.

4) A 12 GHz earth station receiving system has an antenna with a noise temperature of 50 K, a low noise amplifier with a noise temperature of 100 K and a gain of 40 dB, and a mixer with a nise temperature of 1000 K. Find the system noise temperature.