AE 4631 HW 7 workspace

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```
clc
clear
close all

r_E = 6371;                                 % [km]
r_sat = 384400;                             % [km]
c_km = 3E5;                                 % [km/s]
c_m = 3E8;                                  % [m/s]
f = 1.9E9;                                  % [1/s]
P_t = 40;                                   % [W]
A_r = pi*2^2;                               % [m^2]
lambda = c_m/f                              % [m]
T_s = 280;                                  % [K]

% r_E = 6371;                               % [km]
% r_sat = 7371;                             % [km]
% c_km = 3E5;                               % [km/s]
% c_m = 3E8;                                % [m/s]
% f = 2E9;                                  % [1/s]
% P_t = 1;                                  % [W]
% A_r = pi;                                 % [m^2]
% lambda = c_m/f;                           % [m]
% T_s = 300;                                % [K]


% Q1
th_t_rad = 2*asin(r_E/r_sat)
th_t = rad2deg(th_t_rad)

% Q2
G_t = 0.55 * 41253/th_t^2
G_t_dB = 10*log10(G_t)

% Q3
G_t_dB_p = G_t_dB - 4.9

% Q4
r_max = sqrt(r_sat^2-r_E^2)

% Q5
Pr_Pt = (c_km/(4*pi))^2 * 1/(r_max*f)^2
Pr_pt_dB = 10*log10(Pr_Pt)

% Q6
P_r = 10*log10(P_t) + G_t_dB_p - 2 + Pr_pt_dB
P_r_dBm = 30 + P_r

% Q7
```

```
G_r = (4*pi*0.55*A_r)/(lambda^2)
G_r_dB = 10*log10(G_r)

% Q8
E_bit_dBJ = P_r + G_r_dB -10*log10(10^6)
E_bit_dBmJ = E_bit_dBJ + 30

% Q9
N_o = 1.38E-23 * T_s
N_o_dBm = 10*log10(N_o * 10^3)

% Q10
Eb_No_dB = E_bit_dBmJ - N_o_dBm


lambda =

    0.1579


th_t_rad =

    0.0331


th_t =

    1.8993


G_t =

   6.2896e+03


G_t_dB =

   37.9862


G_t_dB_p =

   33.0862


r_max =

   3.8435e+05


Pr_Pt =

   1.0687e-21
```

```
Pr_pt_dB =

 -209.7113

P_r =

 -162.6045

P_r_dBm =

 -132.6045

G_r =

   3.4838e+03

G_r_dB =

   35.4205

E_bit_dBJ =

 -187.1840

E_bit_dBmJ =

 -157.1840

N_o =

   3.8640e-21

N_o_dBm =

 -174.1296

Eb_No_dB =

   16.9456
```

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