AE 4361 – Assignment 6

1) a)

#bits per pixel = 2000 = 2n-1 🡺 n = log21999 = 10.965062756745 = **11 bits**

b)

**Monochrome**:

# pixels = 1024\*14\*1 = 14336 pixels

# bits = 14336 \* 11 = 157,696 bits

**Visible**:

# pixels = 704\*14\*5 = 49,280 pixels

# bits = 49,280 \* 11 = 542,080 bits

**UV**:

# pixels = 128\*4\*2 = 1,024 pixels

# bits = 1,024 \* 11 = 11,264 bits

Total required data length per WAC snapshot = 157,696 + 542,080 + 11,264 = **711,040 bits = 88,880 bytes**

2) a)

a = 384400km, i = 0, e = 0, rE=6371km, μ = 3.986\*105

b)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| FD | SFID | MC1 | MC2 | V1 | V2 | V3 | V4 | V5 | V6 |
| FD | SFID | MC1 | UV1 | V1 | V2 | V3 | V4 | V5 | V6 |
| FD | SFID | MC1 | MC2 | V1 | V2 | V3 | V4 | V5 | V6 |
| FD | SFID | MC1 | UV1 | V1 | V2 | V3 | V4 | V5 | V6 |
| FD | SFID | MC1 | MC2 | V1 | V2 | V3 | V4 | V5 | V6 |

Telemetry frame to send a compressed WAC snapshot with overhead included. Here, each block is 15000 bits (apart from FD and SFID block). Each line is a new visible filter and each UV block sent is a separate UV filter. All MC1s and MC2s combined make up a full monochrome image.

3) a)

Time for a full revolution around Earth =

b) Spacecraft sending throughout ½ of ground pass

Sending time: =

Amount of data sent:

# bits of data will be erroneously decoded per ground pass:

c) Number of bits to be sent:

Amount of time required to send:

However, there will be erroneous bits needed to be resent:

# bits of data will be erroneously decoded:

Amount of time needed to resend bits assuming they are not erroneous upon arrival:

Total amount of time required is 12.98 hours +0.000013 hours = **12.98 hours** (the amount of time to resend bits is negligible)