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# SC Tut to submit

(1) Calculate the semi major axis for the satellite parameters
mean motion = $0.00104\ s^{-1}$

(2) Calculate the apogee and perigee heights for the orbital parameters given below:-
Assume a mean Earth radius of 6371 km; $e = 0.0011501$
$a = 7192.335$ km

(3) A satellite is orbiting in the equatorial plane with a period from perigee to perigee of 12 hour, $e = 0.002$
Radius = 6378.1414 km
Calculate semi-major axis.

(4) The orbit for an Earth orbiting satellite has an $e = 0.15$ and semi-major axis of 9000 km. Determine
(i) It's periodic time
(ii) apogee height
(iii) perigee height

$R = 6371$ km

(5) Satellite in geo-stationary orbit has an apogee height of 35795 km and perigee height of 35779 km,
$R_e = 6378$ km
Determine semi-major axis & e.

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(6) Determine the rate of regression of the nodes and the rate of rotation of the line of apsides for the satellite parameters specified below:-

(i) Inclination angle ($i$) = 98.6328

(ii) $e$ = 0.0011501

(iii) $\eta$ = 0.00104 rad/sec

(iv) $a$ = 7192.335 km

(v) $K_1$ = 66063.1704 $km^2$

(7) Calculate for a frequency of 12GHz and for horizontal and vertical polarization, the rain attenuation which is exceeded for 0.01% for the time in any year for a point rain rate of 10mm per hour. The Earth station altitude is 600m and the antenna elevation angle is 50°. The rain height is 3km.

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(8) A satellite downlink at 12 GHz operates with a transmit power of 6 Watt and antenna gain of 48.2 dB Calculate the EIRP in dBW.

(9) Calculate the gain in decibal of a 3m paraboloid antenna operating at a frequency of 12 GHz. Assume an aperture efficiency of 0.55

(10) The range between a ground station and a satellite is 42000 km Calculate the free space loss at a frequency of 6 GHz

(11) A satellite link operating at 14 GHz has receiver feeder losses of 1.5 dB and a free space loss of 207 dB, Atmospheric absorption loss is 0.5 dB and antenna pointing loss is 0.5 dB (antenna mis-alignment loss). Depolarization losses may be neglected. Calculate the total link loss for clear sky condition.

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An antenna has a noise temperature of 35 K and is matched into a receiver which has a noise temperature of 100K. Calculate:

(i) Noise power density

(ii) Noise power for a bandwidth of 36 MHz

In a link budget calculation at 12 GHz, the free space loss is 206 dB, antenna pointing loss is 1 dB, atmospheric absorption 2 dB. The receiver (G/T) is 19.5 dB/K and receiver feeder losses are 1 dB. The EIRP is 48 dBW. Calculate the carrier to noise spectral density ratio (C/N).

(all losses are -ve)

For a satellite circuit, the carrier to noise ratio are uplinked 23 dB and downlinked 20 dB, intermodulation 24 dB, Calculate overall carrier to noise ration in dB.