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Total Number of Pages: 02

B.Tech
PEEC5418

8th Semester Regular / Back Examination 2015-16
SATELLITE COMMUNICATION SYSTEMS
BRANCH: CSE, ECE, EEE, ELECTRICAL, ETC, IT, ITE, MINING
Time: 3 Hours
Max Marks: 70
Q.CODE: W301

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

- Q1** Answer the following questions: **(2 x 10)**
- a) Explain what the terms centrifugal and centripetal mean with regard to a satellite in orbit around the earth.
 - b) Differentiate between Geostationary and Geosynchronous satellite.
 - c) What are the types of antenna used in satellite.
 - d) An amplifier has a quoted noise figure of 2.5 dB. what is its equivalent noise temperature.
 - e) What is subsatellite point.
 - f) What is multiple access and write down the principle of operation of FDMA.
 - g) What is Doppler shift.
 - h) Write the relation between noise figure and noise temperature.
 - i) Write the different types of cloud attenuation related to satellite communication.
 - j) Differentiate between TDMA and CDMA.
- Q2**
- a) Derive the expression of the power received by an earth station from a satellite transmitter. **(5)**
 - b) A satellite at a distance of 40,000 km from a point on the earth's surface radiates a power of 10 w from an antenna with a gain of 17 dB in the direction of the observer. Find the flux density at the receiving point and the power received by an antenna at this point with an effective area of 10 m². **(5)**
- Q3**
- a) What are the Kepler's three laws of planetary motion. Give the mathematical formulation of Kepler's third law of planetary motion. What do the terms perigee and apogee mean when used to describe the orbit of a satellite orbiting the earth. **(5)**
 - b) A satellite in an elliptical orbit around the earth has an apogee of 39,152 km and a perigee of 500 km. what is the orbital period of this satellite. Assume the average radius of the earth is 6378.137 km and Kepler's constant has the value $3.986004418 \times 10^5 \text{ km}^3/\text{s}^2$ **(5)**

- Q4** A C-band earth station has an antenna with a transmit gain of 54dB. 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 37,500 km by an antenna with a gain of 26dB. The signal is then routed to a transponder with a noise temperature of 500 K, a bandwidth of 36 MHz, and a gain of 110dB. Calculate the path loss at 6.1 GHz. Calculate the power at the output port of the satellite antenna, in dBw. Calculate the noise power at the transponder input in a bandwidth of 36MHz. calculate the C/N ratio in dB in the transponder. Calculate the carrier power at the transponder output. **(10)**
- Q5** a) What do you mean by look angle. Derive an expression for the Azimuth angle for a Geostationary satellite. **(5)**
 b) Explain the attitude and orbit control system of a satellite. **(5)**
- Q6** a) Explain the tropospheric scintillation and low angle fading. **(5)**
 b) An earth station at sea level communicates at an angle of 35° with a geo satellite. The melting level height of the stratiform rain is 3 km. find the physical path length through the rain and also the path attenuation if the specific attenuation is 2 dB/km **(5)**
- Q7** a) A TDMA network of fine earth station shares a single transponder equally. The frame duration is 20 ms,the preamble time per station is $20\mu\text{s}$, and guard bands of $5\mu\text{s}$ are used between bursts. Transmission bursts are QPSK at 30 Mbaud. Calculate the no.of 64 kbps voice channels that each TDMA earth station can transmit and what is the efficiency of the TDMA system. **(5)**
 b) Explain the direct broadcasting of satellite television. **(5)**
- Q8** Write short notes on any two: **(5 x 2)**
 a) Spread spectrum transmission and reception
 b) Cassegrain antenna
 c) Rain and ice effects on satellite link
 d) Faraday rotation in the atmosphere