Registration no: | | | | | | | | | | |

Total Number of Pages: 02 **B.Tech**
PEEC5418

8th Semester Regular / Back Examination 2016-17
SATELLITE COMMUNICATION SYSTEMS
BRANCH(S): AEIE,EIE,IEE
Time: 3 Hours
Max Marks: 70
Q.CODE:Z114

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) What is the difference between multiplexing and multiple access?
b) What is polarization and what is its impact on satellite?
c) What are the types of antenna used in satellite communication?
d) Differentiate between uplink and downlink.
e) Write two salient features of a typical satellite system.
f) Draw the diagram of a double conversion earth station receiver.
g) What is scintillation effect?
h) Differentiate between LEO and MEO.
i) What are the roles of transponder? How many transponders are used in a satellite system?
j) A satellite downlink at 10 GHz operates with a transmit power of 5W and an antenna gain of 48.2 dB. Calculate EIRP in dBW.

Q2 **a)** What are the Kepler's three laws of planetary motion? **(2)**
b) What are look angles? Derive the expression for Azimuth angle of geostationary satellite and also state all the cases to find the Azimuth angle. **(8)**

Q3 **a)** Discuss a typical TDMA system. Discuss the merits and demerits of such a system. **(5)**
b) Derive the link power budget equation. **(5)**

Q4 **a)** A satellite is orbiting in the equatorial plane with a period from perigee to perigee of 12 h. given that the eccentricity is 0.002. Calculate the semi-major axis. The equatorial radius is 6378.1414 km. **(5)**
b) What are the different stages required for launch vehicle. Explain briefly. **(5)**

Q5 **a)** Suppose a 4 GHz receiver with the following gains and noise temperature:T_{in} = 25 K, T_{RF} = 50 K, T_{IF} = 1000 K, T_m = 500 K, G_{RF} = 23 dB, G_{IF} = 30 dB. Calculate the system noise temperature assuming mixer gain ,G_m = 0 dB. Recalculate system noise temperature when mixer has a gain of 10 dB loss. How can the system noise temperature of the receiver be minimized when mixer has a loss of 10 dB. **(5)**

b) An earth station situated in Docklands of London, England needs to calculate the look angles to a geostationary satellite in the Indian Ocean operated by Intelsat. The details of the earth station site and the satellite are: earth station latitude and longitude are $52^0 N$ and 0^0
Satellite longitude is $66.0^0 E$ **(5)**

Q6 **a)** Explain propagation effects and their impact on satellite that is not associated with hydrometers. **(5)**

b) A low earth orbit satellite is in a circular polar orbit with an altitude, h, of 1000 km. A transmitter on the satellite has a frequency of 2.65 GHz. Find (i) the velocity of the satellite in orbit
(ii) the Doppler shift of the received signal at the earth station. Use earth radius as 6378 km. the satellite also carries a Ka-band transmitter at 20 GHz. **(5)**

Q7 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 37,500 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 **(10)**

a. Calculate the path loss at 6.1 GHz
b. Calculate the power at the output port of the satellite antenna in dBW.
c. Calculate the noise power at the transponder input in dBW in a bandwidth of 36 MHz
d. Calculate the C/N ratio in dB
e. Calculate the carrier power in dBW

Q8 **Write short answer on any TWO:** **(5 x 2)**

a) VSAT

b) Attitude and Orbit Control System(AOCS)

c) FDMA

d) Satellite Antennas