M. E. Electronics & Telecommunication Engineering Examination 2019
(1st Year, 2nd Semester)
Satellite Communication (COMM)

Time: Three hours   Full Marks: 100

Answer any <u>five questions</u>
All questions carry equal marks
Answer all the parts of a question in the same place

1. a) State Kepler's three laws of planetary motion. Explain their relevance to artificial satellites orbiting the earth.
   b) Define sidereal day. Derive an expression between period of revolution and radius of circular orbit for an artificial satellite.
   c) Calculate the orbital radius for a geostationary satellite considering earth's sidereal time 23h 56 m 4.09s and Kepler's constant 3.986×10^5 km^3/s^2.

$$((6+4) + (2+4) +4)$$

2. a) What do you mean by GEO? Write the advantages and disadvantages of geostationary satellites.
   b) Draw a block diagram for a dual conversion earth station receiver and explain the function of each block.
   c) What do you mean by noise temperature?

$$((2+4+4) + 8+2)$$

3. a) Explain different losses occurred during radio propagation in a satellite link.
   b) Derive an expression for power budget for a satellite link and hence the carrier to noise ratio at demodulator input.
   c) A satellite at a distance of 40,000 km from a point on the earth's surface radiates a power of 10 W from antenna with a gain 17 dB and operating frequency 11 GHz. Find the flux density at the receiving point, power received by an antenna with a gain of 52.3 dB.

$$(4+12+4)$$

4. a) Write the characteristics of spread spectrum signal.
   b) Explain the operation of direct sequence spread spectrum transmitter and receiver with necessary block diagrams.
   c) Describe the application of CDMA in satellite communication
   d) Explain the acquisition and synchronization mechanisms in CDMA technique

$$(4+6+5+5)$$

5. a) Write the basic requirements for earth station antenna.
   b) Explain the operation of cassegrain antenna with a suitable diagram.
   c) How reliability is achieved in a satellite communication link?
   d) Explain the operation of LNA in a 1:2 redundancy configuration for dual polarization operation.

$$(3+8+3+6)$$

6. a) Define transponder. What is inter-modulation noise?
   b) Compare the uplink power requirement of FDMA and TDMA system.
   c) Explain the TDMA burst and frame structure of satellite system.
   d) Distinguish between fixed-assigned and demand-assigned TDMA satellite access.

$$(4+5+7+4)$$

7. a) Write the names of main sub-systems of a communication satellite. Explain the operation of TT&C subsystem with a block schematic.
   b) What is VSAT? Describe different VSAT network topologies
   c) Write the necessary steps to setup a link between two VSAT terminals using DAMA technique.

$$(7+8+5)$$