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10EC662

**Sixth Semester B.E. Degree Examination, Aug./Sept.2020**  
**Satellite Communications**

Time: 3 hrs.

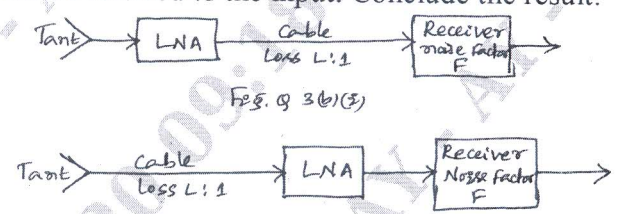
Max. Marks:100

**Note:** Answer any FIVE full questions, selecting atleast TWO questions from each part.

**PART - A**

- 1
  - a. List the frequency – band designations which are in common use for satellite services. (06 Marks)
  - b. What is INTELSAT? How it covers the ‘international traffic’? (04 Marks)
  - c. State and explain the Kepler’s laws of planetary motion, with neat diagram and necessary equations. (10 Marks)
  
- 2
  - a. Explain how a satellite continues to be in orbit and derive expression for :  
 i) Satellite velocity      ii) Orbital period. (08 Marks)
  - b. Define and explain Elevation and Azimuth angles of a ground station antenna for communication, with an orbiting satellite. (06 Marks)
  - c. The orbit of an earth orbiting satellite has an eccentricity of 0.15 and semi major axis of 9000 kms. Determine i) Periodic time      ii) Apogee height      iii) Perigee height. Given  $h = 3.986 \times 10^5 \text{ km}^3/\text{s}^2$ . Assume a mean value of 6371 kms for earth’s radius. (06 Marks)
  
- 3
  - a. Explain Atmospheric and Ionospheric losses for satellite communication. (05 Marks)
  - b. For the system given in fig.Q3(b) (i) and (ii), the receiver noise figure is 12dB, cable loss 5dB , LNA gain 50dB and its noise temperature 150K , Antenna noise temperature 35K, calculate noise temperature referred to the input. Conclude the result. (07 Marks)

Fig.Q3(b)



- c. Calculate rain attenuation for a frequency of 18GHz for circular polarization. The rain height of 2km, a rain rate of 10mm/hr is exceeded for 0.001 percent of the year. The earth station altitude 600m and antenna elevation angle is  $35^\circ$  ( $a_h = 0.0751$  ,  $a_v = 0.0691$  ,  $b_h = 1.099$  ,  $b_v = 1.065$ ). (08 Marks)
  
- 4
  - a. What is a Satellite transponder? With a neat diagram, explain the overall frequency arrangement of typical C – band communication satellite. (06 Marks)
  - b. With the help of neat diagram, explain the forms of altitude control. (10 Marks)
  - c. Explain TT and C functions with block diagram (Telemetry, Tracking and Command). (04 Marks)

**PART - B**

- 5
  - a. With a neat diagram, explain the outdoor and indoor units of a receive – only home TV system. (10 Marks)
  - b. An FM/TV carrier is specified as having a modulation index of 2.571 and a top modulating frequency of 4.2 MHz. Calculate the protection ration required to give a quality impairment factor of (i) 4.2      ii) 4.5. (04 Marks)
  - c. Explain Preassigned FDMA. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 6 a. Explain Unique Word detection. Obtain equation for miss probability and false detection probability. (10 Marks)
- b. The carrier to interference ratio at the ground receiving antenna is 23.3 dB. For the uplink (C/I) ratio is 27.53 db. Find the overall ratio  $(C/I)_{\text{ant}}$  for  $(I/C)_U = 0.001766$  and  $(I/C)_D = 0.004436$ . (06 Marks)
- c. What are different interferences that occur in FDMA system? (04 Marks)
- 7 a. Explain i) Transponder capacity ii) Frequency and Polarization. (08 Marks)
- b. Explain the principles of Global positioning satellite system in detail. (06 Marks)
- c. Describe the operation of typical VSAT system. (06 Marks)
- 8 Write short notes on :
- a. SPADE system.
- b. Earth Eclipse of satellites.
- c. Transmit – Receive earth stations.
- d. Radar sat. (20 Marks)

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