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Sixth Semester B.E. Degree Examination, June/July 2015
Satellite Communication

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. Explain frequency allocations for a satellite. (06 Marks)
- b. State and explain Kepler's three laws of planetary motion. (06 Marks)
- c. With the help of neat diagram, explain Keplerian orbital elements. (08 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 9000kms. 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. (04 Marks)
- b. Calculate horizontal, vertical and circular polarizations for a frequency of 12GHz, the rain attenuation is exceeded for 0.01% of the time in any year, for a point rain rate of 10mm/hr. The earth station attitude is 600 meter, and the antenna elevation angle of 50°. The rain height is 3km and $a_h = 0.0188$; $b_h = 1.217$; $a_v = 0.168$; $b_v = 1.2$.
Note : All lengths and heights are in kms, and rain rate is in mm/hour. (10 Marks)
- c. Explain the following : (i) Antenna Noise Temperature (ii) Amplifier Noise Temperature (iii) System Noise Temperature referred to input. (06 Marks)
- 4 a. With the help of neat diagram, explain two forms of attitude control. (10 Marks)
- b. What is satellite transponder? With a neat diagram explain the overall frequency arrangement of typical C-band communication satellite. (06 Marks)
- c. Write a short note on Thermal control. (04 Marks)

PART – B

- 5 a. Explain indoor and outdoor unit of direct Broadcasting satellite TV with block diagram. (10 Marks)
- b. What is meant by pre-assigned FDMA? With a neat diagram, explain single channel per carrier. (10 Marks)
- 6 a. Explain the concept of TDMA and FDMA using appropriate figures. Discuss the relative advantages and disadvantages of each. (10 Marks)
- b. The carrier to interference ratio at the ground receiving antenna is 23.3 dB. For the uplink (C/I) ratio is 27.53dB. Find the overall ratio $(C/I)_{\text{ant}}$ for $(I/C)_v = 0.001766$ 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. Describe the operation of typical VSAT system. (06 Marks)
- c. Explain in detail the satellite mobile services. (06 Marks)
- 8 Write short notes on :
 - a. GPS and its uses
 - b. Radarsat
 - c. SPADE system
 - d. Earth Eclipse of satellites (20 Marks)

