

**R13**

Code No: 1188K

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year II Semester Examinations, May - 2017

**SATELLITE COMMUNICATIONS**

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**PART - A**

(25 Marks)

- 1.a) Define Elevation angle and write an expression for it. [2]
- b) List different bands along with frequency range for satellite communications. [3]
- c) An amplifier has a quoted noise figure of 2.5 dB. What is its equivalent noise temperature. [2]
- d) A geographic area subtends an angle of approximately  $6^\circ \times 3^\circ$ , when viewed from geostationary orbit. What dimension must a reflector antenna have to illuminate half of this area with a circular beam  $3^\circ$  in diameter at 11 GHz. [3]
- e) What is mean by multiple access? [2]
- f) Compare TDMA and FDMA [3]
- g) What are the different signals transmitted by GPS satellites? [2]
- h) What are the features of GPS? [3]
- i) List the features of pure ALOHA. [2]
- j) List the features of slotted ALOHA. [3]

**PART - B**

(50 Marks)

- 2.a) Discuss the effects of sun and moon on satellite communication.
- b) Illustrate geostationary transfer orbit and AKM approach to geostationary orbit using a neat diagram. [5+5]

**OR**

- 3.a) A low earth orbit satellite is at an altitude of 250km above the earth's surface. Assuming earth's diameter is approximately 12,756.28km, calculate the period of when the orbit is circular. Also find the linear velocity of the satellite along its orbit. [5+5]
- b) Write short notes on solar eclipse.

- 4.a) Explain the operation of a TT&C system using relevant block diagram.
- b) An earth station has a diameter of 30m, has an overall efficiency of 69% and is used to receive a signal at 4150MHz. At this frequency the system noise temperature is 79K when the antenna points at the satellite at an elevation angle of  $28^\circ$ . What is the G/T under these conditions? If heavy rain causes the rise in system noise temperature to 88K, what is the new G/T value? [5+5]

**OR**

- 5.a) Discuss the effects of sun and moon on satellite communication.
- b) Illustrate geostationary transfer orbit and AKM approach to geostationary orbit using a neat diagram.

- 5.a) Explain the role of a transponder in satellite communication. Also draw the simplified diagram of a double conversion transponder for 14/11 GHz band. [5+5]
- b) Briefly discuss the link budget. [5+5]
6. Explain the principle of CDMA and spread spectrum transmission and reception. [10]

OR

- 7.a) Assume that a TDMA system uses a  $125\mu\text{s}$  frame time. Find the number of channels that each earth station can send within the TDMA frame when i) No time is lost in overheads, preambles ii) A  $5\mu\text{s}$  preamble is added at the beginning of each earth stations transmission. iii) A  $5\mu\text{s}$  delay preamble is added to each earth stations transmission and  $2\mu\text{s}$  guard band is allowed between every transmission. [5+5]
- b) Explain the principle of FDMA. [5+5]
- 8.a) Draw the block diagram of a typical earth station transmitter and explain. [5+5]
- b) Explain different power test methods. [5+5]

OR

9. Discuss in detail different GPS. [10]
10. Explain how message is transmitted by TDMA. [5+5]
- OR
- 11.a) Briefly discuss the satellite packet switches. [5+5]
- b) Elaborate packet reservation. [5+5]

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