Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(NEW) EXAMINATION – SUMMER 2019

Subject Code:2171007 Date:14/05/2019

Subject Name:Satellite Communication

Time:02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Define following Term for Earth Orbiting Satellites. (i) Mean Anomaly (ii) Right Ascension of ascending node (iii) Prograde orbit.	**03**
	(b)	Explain the Effect of a nonspherical earth on orbital path of satellite.	**04**
	(c)	A Satellite Orbit has an eccentricity of 0.2 and a semimajor axis of 10,000km. Find the Values of (a) The Latus Ractum (b) the minor axis. (c) The Distance between Foci.	**07**
Q.2	**(a)**	Define and Explain the terms Roll, pitch and yaw.	**03**
	(b)	Explain why omnidirectional antenna must be used aboard a satellite for telemetry and command during the launch phase. How is the satellite powered during this phase?	**04**
	(c)	Determine the limits of visibility for an earth station situated at mean sea level, at latitude 48.42 degrees north and longitude 89.26 degrees west. Assume the minimum angle of elevation of 5^0.	**07**
		OR	
	(c)	Define Satellite Look Angles. Derive the Equation of Satellite look angles.	**07**
Q.3	**(a)**	Describe the major effects the ionosphere has on transmission of satellite signals at frequencies of (a) 4 GHz (b) 12 GHz .	**03**
	(b)	Fig 1. Shows INTELSAT 2-ms Frame. Calculate the frame efficiency for an INTELSAT frame given the following information. Total Frame Length =120,832 symbols Traffic Bursts per frame=14 Reference bursts per frame= 2 Guard Interval=103 symbols.	**04**

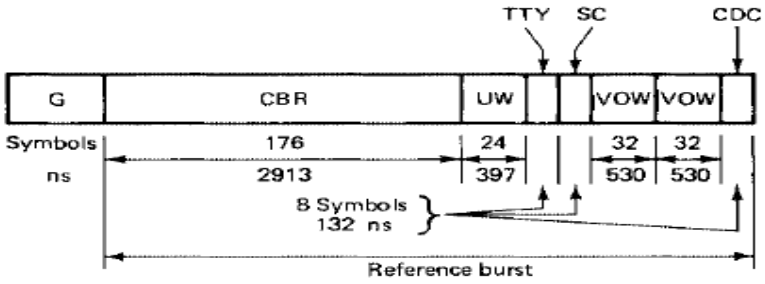

Fig. 1

(c) At Frequency of 12GHz, the rain attenuation which is exceeded for 0.01 percent of the time any year, for a point rain rate of 10mm/h. the earth station altitude is 600m and antenna elevation angle is 50^0.The rain height is 3km. Calculate Rain Attenuation for horizontal and vertical polarizations. For f=12GHz ,a_h=0.0188, b_h=1.217, a_v=0.0168, b_v=1.2. **07**

OR

Q.3 **(a)** Explain What is meant by orthogonal polarization and the importance of this in satellite communication. **03**

(b) Explain Satellite switched TDMA. **04**

(c) A geostationary satellite is stationed at 105^0W and transmits a vertically polarized wave. Determine the angle of polarization at an earth station at latitude 18^0N , longitude 73^0W. **07**

Q.4 **(a)** Explain what is meant by redundant receiver in connection with communication satellites. **03**

(b) Calculate the free space loss as a power ratio and in decibels for transmission at frequencies of (a) 4 GHz, (b) 6GHz (c) 12 GHz and (d) 14 GHz; the range being 42,000 km. **04**

(c) Explain what is meant by (a) Antenna noise temperature.(b) amplifier noise temperature and (c) System Noise temperature referred to input. A system operates with an antenna noise temperature of 40K and an input amplifier noise temperature of 120K. Calculate the available noise power density of the system referred to the amplifier input. **07**

OR

Q.4 **(a)** Define and explain the term 1-dB compression point. What is the significance of this point in relation to the operating point of TWTA? **03**

	(b)	Explain what is meant by EIRP. A transmitter feeds a power of 10W into an antenna which has a gain of 46 dB. Calculate the EIRP in (i) Watts (ii) dBW.	**04**
	(c)	Explain what is meant by saturation flux density. The power received by a 1.8-m parabolic antenna at 14 GHz is 250 pW. Calculate the power flux density (a) in W/m^2 (b) in dBW/m^2 at the antenna.	**07**
Q.5	**(a)**	Explain Channeling Scheme for the SPADE System.	**03**
	(b)	Explain RADARSAT in detail.	**04**
	(c)	Explain DBS-TV link budget in detail.	**07**

OR

Q.5	**(a)**	Explain in brief Demand Assigned FDMA.	**03**
	(b)	Explain ORBCOMM in detail.	**04**
	(c)	Explain DBS –TV Receiver with necessary block diagram.	**07**

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