1/7/12 Code: A-20

Code: DE17
Time: 3 Hours

Subject: ELEMENTS OF SATELLITE COMMUNICATION

Max. Marks: 100

DECEMBER 2008

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q. 1. must be written in the space provided for it in the answer book supplied and nowhere else.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or best alternative in the following:

(2x10)

- a. A Satellite is moving in an elliptical eccentric orbit whose semi-major axis is 16000 Km. If the difference between apogee and perigee is 30,000 Km, then the orbit eccentricity will be
 - **(A)** 0.32

(B) 0.5

(C) 0.93

- **(D)** 0.63
- b. The antenna gain referred to the input of the low noise amplifier of a satellite earth station is 125.7
 dB. If the earth station system noise temperature referred to the input of the LNA is 236.05x10⁶
 K then, the antenna gain to noise temperature ratio will be
 - (A) 25.2 dB/K

(B) 41.97 dB/K

(C) 32.56 dB/K

- **(D)** 16.9 dB/K
- c. The approximate frequency range in megahertz for channel two of Cable TV is
 - (A) 10 to 20

(B) 100 to 150

(C) 54 to 60

- **(D)** 200 to 250
- d. INSAT-1B was launched in
 - (A) August 1975

(B) August 1960

(C) July 1970

- **(D)** August 1983
- e. The life span of a typical COMSAT will be usually
 - (A) Two-to-four years
- **(B)** Twelve-to-fifteen years
- **(C)** Fifteen-to-twenty years
- **(D)** Six-to-nine years
- f. The year of start of DBS systems in Western countries was
 - **(A)** 1970

(B) 1968

(C) 2000

- **(D)** 1986
- g. The typical LNA noise temperature of INTELSAT standard 'C' earth station is

1/7/12 Code: A-20

(A) 20 K (C) 120 K (B) 70 K (D) 200 K

h. The process gain of a DS spread spectrum technique system, with a spreading signal of bit rate ' f_c ' for a data rate of ' f_b ' is defined as

(A) $G_p = f_c \cdot f_b$ (B) $G_p = f_b/f_c$

- (C) $G_p = 2 \cdot f_c/f_b$ (D) $G_p = f_c/f_b$
- i. For the same data rates QPSK requires
 - (A) One fourth the bandwidth of BPSK
 - **(B)** Three fourths the bandwidth of BPSK
 - **(C)** the same bandwidth as that of BPSK
 - (D) half the bandwidth of BPSK
- j. The range between a ground station and a satellite is 42,000 Km. At a frequency of 6 GHz, the free-space loss for a wave velocity of 10^8 m/s would be,

(A) 100.5 dB **(B)** 200.4 dB **(C)** 90.25 dB **(D)** 125.5 dB

Answer any FIVE Questions out of EIGHT Questions. Each question carries 16 marks.

- Q.2 a. How many frequency bands have been allocated for use with satellite communication? What are the factors which determine the optimum radio frequency range of satellite communication? Which is the quantity that serves as the "figure of merit" in the link design and what does it signify? Mention its unit.
 (10)
 - b. In a link budget calculation at 12 GHz, the free-space loss is 206 dB, the antenna pointing loss is 1 dB, and the atmospheric absorption is 2 dB. The receiver G/T ratio is 19.5 dB/K, and receiver feeder losses are 1 dB. If the EIRP is 48 dBw, calculate the carrier-to-noise power ratio. Take noise bandwidth as 75.6 dBHz.
- Q.3 a. Write a brief note on "baseband signal". Explain briefly the frequency division multiplexing for satellite communications.
 - b. What do you mean by threshold in FM detector? Support your answer with a neat illustration. (4)
- Q.4 a. Draw the schematic block diagram of a digital communication system and mention the function of each block.(6)
 - b. Briefly explain ASK, PSK and FSK modulation schemes. (10)

1/7/12 Code: A-20

Q.5	a.	What are the advantages of multiple access? Distinguish between "fixed access" and "demand access". Explain DAMA in brief. (9)	
		b. What is "direct sequence spread spectrum modulation techniquesed? (3)	hnique" Where is this technique
	c.	With a block schematic for illustration, briefly explain the DBS sys	stem. (4)
Q.6	a.	Which are the problems involved with communication satellites equation for the geosynchronous orbit height above equator with its value if the radius of the Km. (12)	usual notations and comment on earth is 6370
	b.	A satellite is moving in a circular orbit at a distance of 640 Km. be 6360 Km determine the orbit velocity. (4)	Taking the radius of the earth to
Q.7	a.	What is transponder? Mention its types. What are the elements of the frontend electronic system of a conventional satellite repeater? Draw its block schematic and briefly explain. (12)	
	b.	Write a note on INSAT-II systems.	(4)
Q.8	a.	Draw the basic block diagram of an earth station that transmits satellite and briefly explain. (10)	and receives information from a
	b.	What are VSAT? Comment in brief on their major applications.	(6)
Q.9		Briefly explain the following:	(16)
		(i) Satellite Television(ii) Cable channel frequencies	