



- (A) 20 K (B) 70 K  
(C) 120 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. **(6)**

**Q.3** a. Write a brief note on "baseband signal". Explain briefly the frequency division multiplexing for satellite communications. **(12)**

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)**

- 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 technique” Where is this technique used? (3)
- c. With a block schematic for illustration, briefly explain the DBS system. (4)
- Q.6** a. Which are the problems involved with communication satellites regarding the orbit? Derive the equation for the geosynchronous orbit height above equator with usual notations and comment on its value if the radius of the earth is 6370 Km. (12)
- b. A satellite is moving in a circular orbit at a distance of 640 Km. Taking the radius of the earth to be 6360 Km determine the orbit velocity. (4)
- 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 and receives information from a satellite and briefly explain. (10)
- 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