

DiplETE – ET (OLD SCHEME)

Code: DE17
Time: 3 Hours

Subject: ELEMENTS OF SATELLITE COMMUNICATION

Max. Marks: 100

JUNE 2009

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 the best alternative in the following: (2 × 10)

a. ITU has divided the world into

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|---------------|---------------|
| (A) 3 regions | (B) 4 regions |
| (C) 2 regions | (D) 6 regions |

b. The system which collects data from sensors of space craft and sends to the controlling earth station is called _____

- | | |
|---------------------|----------------------|
| (A) Tracking system | (B) Telemetry system |
| (C) Power system | (D) AOCS system |

c. The energy per bit for QPSK is

- | | |
|-----------------------------|----------------------------------|
| (A) $E_b = \frac{A^2 T}{2}$ | (B) $E_b = \frac{A^2 T}{4}$ |
| (C) $E_b = \frac{A^2}{2}$ | (D) $E_b = \frac{A^2}{\sqrt{2}}$ |

d. The farthest distance that a satellite orbit reaches from the earth surface is called

- | | |
|--------------|----------------|
| (A) Apogee | (B) Perigee |
| (C) Prograde | (D) Retrograde |

e. The height of the geostationary orbit from the earth's surface is

- | | |
|---------------|---------------|
| (A) 900 Kms | (B) 1800 Kms |
| (C) 42500 Kms | (D) 35860 Kms |

f. Long distance communication system via satellite in Ku band uses frequencies in the range of

- | | |
|-----------------|---------------|
| (A) 3-6 GHz | (B) 11-14 GHz |
| (C) 100-200 GHz | (D) 3-6 MHz |

g. The multiple satellite access system which suffers from the presence of intermodulation products in

- | | |
|----------|----------|
| (A) TDMA | (B) FDMA |
| (C) CDMA | (D) DAMA |

- h. The video carrier frequency (in MHz) usually employed for the T-9 cable TV channel is around
- (A) 7 (B) 25
(C) 19 (D) 13
- i. The satellite orbit is termed as a retrograde orbit when its angle of inclination
- (A) becomes 45° (B) exceeds 90°
(C) zero (D) becomes 90°
- j. Multipoint communication capabilities are more in
- (A) Fiber optics (B) Satellite
(C) Ethernet (D) Telephones

**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 communications and which are they? Illustrate in the form of table the frequency allocations for mobile satellite service. (8)
- b. Draw and explain the switched star topology used in cable TV system. (8)
- Q.3** a. Explain the importance of G/T ratio in satellite link design. (8)
- b. What do you mean by TDMA? Describe TDMA frame structure. (8)
- Q.4** a. What is QPSK? Describe generation of QPSK. (8)
- b. Draw and explain the block diagram of earth station transmitter. (8)
- Q.5** a. Explain how a satellite is placed in geostationary orbit. (8)
- b. What are altitude and orbit control sub-system? Explain how do they perform their functions? (8)
- Q.6** a. What is meant by station keeping of a satellite? Explain its significance and methods to achieve it. (8)
- b. Describe the important features of INSAT-I satellite. (8)
- Q.7** a. Explain S/N and C/N in FM. (8)
- b. Explain the following terms:
- (i) Look angles (ii) Synchronous orbit. (8)
- Q.8** a. Explain in detail why 6/4 GHz communication is used in satellite communication systems. (8)

- b. Derive the link equation as referred to a geostationary satellites. **(8)**

Q.9 Write short notes on any **TWO** of following:- **(8 × 2=16)**

- (i) Direct broadcast satellite.
- (ii) Satellite transponder.
- (iii) Data broad casting using satellites.