ROLL NO. _____

Code: AE22 **Subject: SATELLITE & SPACE COMMUNICA**

AMIETE – ET (OLD SCHEME)

Time: 3 Hours **JUNE 2012** **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

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.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **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. The GEO satellite use frequency band extending from

(A) 3.2 to 50 GHz **(B)** 3.2 to 50 MHz
(C) 1.2 to 20 GHz **(D)** 1.2 to 2000 MHz

b. The TELESTAR I was launched

(A) July 1952 **(B)** July 1962
(C) May 1968 **(D)** May 1966

c. The first commercial satellite was launched in

(A) 1962 **(B)** 1965
(C) 1967 **(D)** 1977

d. Weather satellite employs

(A) Polar satellite **(B)** Geo –stationary satellite
(C) Both of these **(D)** either of these

e. The Cyclic codes are

(A) Linear codes **(B)** Non-linear Codes
(C) Weighted codes **(D)** FEC code

f. A coding technique is highly efficient if

(A) Number of error detecting is high
(B) Number of error correcting is high
(C) Both of these
(D) None of these

ROLL NO. _____

g. Satellite capacity depends upon

(A) Weight that can be placed in orbit
(B) Panel area available for energy dissipation
(C) Transmitted power
(D) All the above

h. The orbital velocity of a satellite

(A) is directly proportional to its distance from the earth's surface
(B) is inversely proportional to square root of the distance from earth's center
(C) depends upon the trust with which it is launched
(D) it is continuously changing as the satellite revolves

i. A payload that is invariably found on all communication satellite is the

(A) Optical telescope **(B)** VHRR
(C) Transponder **(D)** Vidocon camera

j. The multiple satellite access technique suitable only for digital transmission is the

(A) Time Division Multiple Access **(B)** Frequency Division Multiple Access
(C) Code Division Multiple Access **(D)** Both **(A)** and **(B)**

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

Q.2 a. What are Kepler's three laws of planetary motion? Give the mathematical formulation of Kepler's third-law of planetary motion. What do the terms perigee and apogee mean when used to describe the orbit of a satellite orbiting the earth? **(10)**

b. A satellite is in an elliptical orbit with perigee of 1000 km and an apogee of 4000 km. Using a mean radius of 6378.14 km, find the period of the orbit in hours, minutes, seconds and the eccentricity of the orbit. **(6)**

Q.3 a. Derive general link equation. Find the expression for C/N and G/T ratio. **(8)**

b. In a satellite communication link the uplink carrier to noise ratio $(C/N)_u$ is 20 dB where as the downlink carrier to noise ratio $(C/N)_D$ is 25 dB. Find the link carrier to Noise ratio. **(8)**

Q.4 a. What are ionospheric scintillations? How are they caused? Discuss its effect on the radio wave. **(8)**

b. What is the system noise temperature? Derive the expression for equivalent noise temperature. **(8)**

Q.5 a. Explain analog FM/FDM television transmission through satellite. Write down the expression for S/N ratio calculation for satellite TV links. **(8)**

b. Write a note on SCPC FM links. **(4)**

c. A SCPC–FM satellite link has an RF channel bandwidth of 45 kHz and a base band maximum frequency of 3.4 kHz. De-emphasis provides a subjective improvement in base band S/N ratio of 7dB. Calculate the base band S/N ratio for the voice channel for a receiver C/N ratio of 13dB. If the FM demodulator has an FM threshold at 6 dB, what is the link margin for this system? **(4)**

Q.6 a. What is meant by satellite attitude, and briefly describe two forms of attitude control? **(6)**

b. With a sketch for illustration, briefly describe the channelling scheme for the twelve transponders of a typical C-band communications satellite. **(10)**

Q.7 a. What is 'Multiple Access'? Which multiple access technique is widely used as a method of sharing the bandwidth of satellite transponders? **(6)**

b. Distinguish between pre-assigned and demand assigned traffic in relation to a satellite communication network. **(3)**

c. What is the major difference between the cellular system and satellite system? Explain the frequency plan for 54 MHz transponder carrying 900 demand access channel? **(7)**

Q.8 a. Describe how convolution coding is achieved. State some of the main advantages and disadvantages of this type of code compared with block codes. **(8)**

b. What are error detection coding technique? Explain the linear and cyclic block code in detail. **(8)**

Q.9 a. Explain VSAT and how it causes interference to other satellite devices. **(8)**

b. Explain with a neat sketch satellite switching of three spot beams. **(8)**