4 Attempt any two parts of the following : 10×2=20

(a) Explain the difference between error detection and correction. Why would FEC normally be used in satellite circuits ? A transmission takes place where the average probability of error is 10^{-6}. Given that a message containing 10^8 bits is transmitted, what is the average number of bit errors to be expected ?

(b) A convolutional code is described by $g_1 = [1\ 0\ 0]$, $g_2 = [1\ 0\ 1]$, $g_3 = [1\ 1\ 1]$.

(i) Draw the encoder corresponding to this code.

(ii) Draw the state transition diagram and the trellis diagram for this code.

(iii) Find the transfer function and the free distance of this code.

(c) Explain the various propagation effects and their impact on satellite-earth links. Also write note on depolarisation effects and cloud fire effects on these links.

5 Attempt any two parts of the following : 10×2=20

(a) Write short notes on :

(i) VSAT

(ii) Non-geostationary satellites

(iii) LEO satellites for internet transmission.

(b) Explain different types of satellite based mobile systems. What is the role of INMARSAT ?

(c) Explain how global positioning is achieved with a neat diagram, explain a GPS receiver.

Printed Pages : 4

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0313 Roll No.

B. Tech.

(SEM. VII) EXAMINATION, 2007-08

SATELLITE COMMUNICATION

Time : 3 Hours] *[Total Marks : 100*

Note : *(i) Attempt all questions.*
(ii) All questions carry equal marks.
(iii) Be precise in your answer.
(iv) No second answer book will be provided.

1 Attempt any four parts of the following : 5×4=20

(a) In what way satellite has an edge over communication compared to other methods? What are the future trends in satellite communications ?

(b) Explain the following with respect to satellites :

(i) Ascending and Descending modes.

(ii) Satellite axes

(iii) Look, azimuths, elevation angles

(iv) Inclination perigee, apogee.

(c) A satellite is orbiting in a geosynchronous orbit of radius 41500 km. Find the velocity and time of orbit. What will be the change in velocity if the radius reduces to 36000 km? Assume $g_o = 398600.5\ km^3s^2$.
What are the torques that affect the position of a geostationary satellite ?

(d) Explain the effect of a solar eclipse on the performance of a geostationary satellite. In what way it is related to fixing the parking place of a satellite.
A low orbiting satellite has an 8-hour prograde orbit. How long during each orbit will an earth station be able to communicate with it above an elevation angle of 15% ?

(e) Explain how attitude and orbit control is achieved from an earth station. A satellite receives sunrays at 7° 6' and the duration of the eclipse is 56 min. Calculate the radius of orbit and height of satellite.

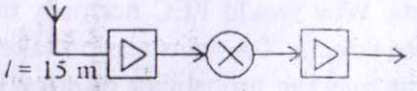
(f) Explain the master control facility including the statellite control earth station, satellite control center and the UPS.

2 Attempt any **four** parts of the following : 5×4=20

(a) Explain why some satellites employ cylindrical solar arrays whereas other employ solar rail arrays for the production of primary power. State the typical power output to be expected from each type. Why is it necessary to carry batteries in addition to solar cell arrays ?

(b) (i) Briefly explain the various methods satellite stabilisation.
(ii) What is a despun antenna ? How is despping achieved ? – Explain.

(c) In a satellite receiving system the equivalent noise picked up by antenna is 18° K. The antenna is connected to the received through a cable having a loss factor of 0.15 dB/m and of 15 m length. The physical temperature for the design is to be considered as 290° K. The stages of the receiver is shown in fig. below. Calculate the overall noise temperature and G/T ratio if the received power is -96 dB.



T_o = 290°K GLNA = 15 dB, Gm = –1 dB, Gif = 40 dB.
Ta = 29 K, Tm = 300 K, Tif = 800 K

(d) Explain the following briefly :
(i) TT & C subsystem (ii) Transponder.

(e) The EIRP of a 240 W transponder is 57 dBW. Calculate the approximate gain of the antenna. If the transponder is switched to 120 W, calculate the new [EIRP], assuming that the same antenna is used.

(f) Show that C/N of a satellite receiver system is directly proportional to G/T ratio.

3 Attempt any **two** parts of the following : 10×2=20

(a) Distinguish between multiplexing and multiple access. Compare FDMA, TDMA, CDMA and DAMA.

(b) Describe the concept of threshold in an FM demodulator and how this is useful in satellite communication system. An FM system has a receiver threshold of 15 dB. How much recieved carrier power and RF bandwidth is needed to transmit a 4 kHz baseband signal with a demodulated SNR of 40 dB ? Take N_o = 10 to the power of -10 W/Hz.

(c) In a digital transmission E_b/N_o = 11 dB for a polar NRZ transmission over BPSK. The system uses 8 bits per level. Calculate the S/N ratio in dBS.
With a block diagram, explain a typical PCM/TDM system.