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DM-7081-82

B. E. III (Sem. VI) (ECC) Examination

January - 2008

Satellite Communications

Time : 3 Hours] [Total Marks : 100

DM–7081

Instructions :

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :
☛ B. E. 3 (Sem. 6) (ECC)

Name of the Subject :
☛ Satellite Communications

☛ Subject Code No. : 7 0 8 1 ☛ Section No. (1, 2,.....) : 1

Seat No. :

Student's Signature

(2) Attempt **all** questions.

(3) Figures to the right indicate full marks.

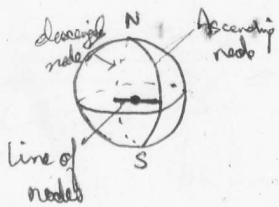
(4) Assume necessary data wherever **necessary** and mention them.

(5) Scientific calculators casio FX-82/83 and equivalent are allowed.

1 (a) Answer the following questions : 10

(1) List out the services provided by satellites. FSS, BSS, Mobile satellite service, Navigational ,, ,,

(2) Explain what is meant by "Line of nodes". line joining ascending & descending nodes through the centre of Earth is known as line of nodes



(3) Define the term 1-dB compression point.

(4) Which multiple-access technique is used in thin route circuit traffic mode ? SCPC

(5) Explain what is meant by noise factor. For what source temperatures noise factor is defined ? Amplifier noise

Source → room temp
$T_o = 290K$

(6) An earth station radiates an (EIRP) of 54 dBW at a frequency of 6 GHz. Assuming total losses amount to 200 dB, calculate the power flux density at the satellite receiver.

$\lambda = \frac{c}{f} = \frac{3\times10^8}{6\times10^9} = 0.05$

$A_o = 10\log\left(\frac{\lambda^2}{4\pi}\right) = -37.01$ dB

$[EIRP] = [\Psi_n] + [A_o] + [LOSSES] - [RFL]$

$54 = -37.01 + 200$

-183.01 dB

EIRP is higher → 14/12 GHz
↳ Smaller antennas can be used with reciever

(7) Suggest reasons why the 14/12 GHz band has been selected for direct to home satellite broadcasting.

(8) What is function of the burst-code in a TDMA burst? used to establish burst timing

$\frac{N_0}{C} = 10^{-2.5} + 10^{-1.5}$
$= 0.03478$

$\left[\frac{C}{N_0}\right] = -10\log(\ )$

(9) The [C/M] values for a satellite circuit are uplink 25dB, downlink 15 dB, calculate the overall [C/M] value.

(10) Define the term : Argument of perigee. angle from ascending node to perige, measured in orbital plan

(11) Explain what is meant by apogee height and perigee height. The cosmos 1675 satellite has an apogee height of 39,342 km and a perigee height of 613 km. Determine the semimajor axis and the eccentricity of it's orbit. Assume a mean earth radius of 6371 km. R at 6 the earth's cent in the direction of satel

$r_a = a(1+e)$
$r_p = a(1-e)$

2 (a) Prove that at room temperature the noise factor of a lossy network is equal to it's power loss. 4

(b) Discuss the On-board signal processing for FDMA/TDM operation, in detail. 8

OR

(b) Discuss how pre-assignment may be implemented in a TDMA network. What is the advantage of TDMA over FDMA in this respect ? 8

(c) Distinguish between bandwidth-limited and power-limited operation as applied to an FDMA network. 4

OR

$P_{miss} = \sum_{I=E+1}^{N} \frac{N!}{I!(N-I)!} P^I (1-P)^{N-I}$

(c) Determine the miss probability and the probability of false detection for the following values : 4

M = 40, E = 5, P = 10^{-3} I = 6

$P_F = 2^{-N} \sum_{I=0}^{5} \frac{N!}{I!(N-I)!}$

3 Briefly discuss the following : (any three) 18

(1) Sun-synchronous orbit

(2) Preassigned SCPC-FDMA

(3) Feeder losses and Antenna Misalignment losses in satellite-communication.

(4) Carrier recovery circuit applied to the traffic burst in TDMA.

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Name of the Examination :

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Name of the Subject :

☛ Satellite Communications

☛ Subject Code No. : 7 0 8 2 ☛ Section No. (1, 2,.....) : 2

Seat No. :

Student's Signature

(2) Attempt all questions.

(3) Figures to the right indicate full marks.

(4) Assume necessary data wherever necessary and mention them.

(5) Scientific calculators casio FX-82/83 and equivalent are allowed.

4 (a) Do as directed : (one mark each) 10

(1) Define transponder.

(2) What is the main function of the input de-multiplexer used abroad a communication satellite ?

(3) Explain what is meant by redundant earth station.

(4) The orientation of satellite in space is called _____ of satellite.

(5) Why GPS user requires only a GPS receiver instead of GPS transmitter and receiver both ?

(6) Average information per message is called _____

(7) Define MRTS service offered by MSAT.

(8) Length of the word is the number of letters in word. True or False.

(9) Define Hamming distance.

(10) Why parity bits are transmitted alongwith information bits ?

(b) Explain what is meant by satellite attitude and briefly describe two forms of attitude control. 5

(c) With the aid of a block schematic briefly describe the functioning of the indoor receiving unit of a satellie TV receiving system intended for home reception. 5

5 (a) Draw and scale the uplink and downlink chanelling schemes for 500 MHz bandwidth c-bond satellite, accomodating the full complement of 36 MHz badnwidth transponders. Assume the use of 4 MHz guardbands. 7

(b) Find the channel capacity of the binary symmetric channel (BSC) shown in Fig. 1. 8

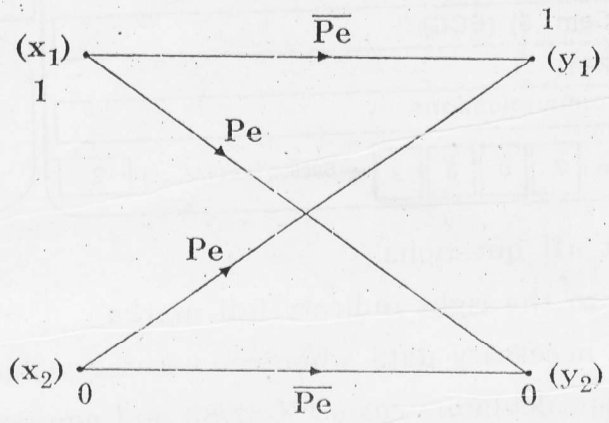

Fig. 1

OR

5 (a) Define QPSK and explain QPSK modulator with necessary block diagram. 8

(b) Explain encoding of linear block codes in detail. 7

6 (a) Describe the operation of a typical VSAT system and list some of the short comings of present day VSAT systems. 8

(b) A zero memory source emits six messages with probabilities 0.3, 0.25, 0.15, 0.12, 0.1 and 0.08. Find the 4-ary (quaternary) Huffman code. Determine its average word length, the efficiency and the redundancy. 7

0.3
0.25
0.15
0.12
0.10
0.08
0.00

0.3
0.3
0.15
0.12

OR

6 (a) Explain GPS system in brief. State why minimum of four satellites must be visible at any earth locations utilizing the GPS system for position determinations. 8

(b) Find a generator polynomial $g(x)$ for a $[7, 4]$ cyclic code and find code vectors for the following data vectors 1010, 1111, 0001 and 1000. 7

↳ so that we can find (reciever position)

1) latitude
2) Longitude
3) Altitude
4) time