Seventh Semester Examination -2007

COMMUNICATION SYSTEMS

Full Marks - 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest'

The figures in the right-hand margin indicate marks.

1. Answer the following questions : [2x10
   (a) What are the advantages of single mode fiber over multi mode fiber ?
   (b) List the factors that contribute to attenuation in optical fibers..
   (c) The bandwidth of a opticalfiber is rated as 10GHzkm. What is the distance oiver which the fiber can be used to transmit 2GHz signal without the use of a repeater.
   (d) Draw the equivalent circuit of a Photo Diode. (Circuit only)
   (e) Draw the typical wavelength verses attenuation characteristic for a optical fiber.
   (f) Define transponder. What are its uses in a communication satellite system ?
   (g) Is it possible to use 100MHz frequency for communication with an artificial communication satellite ? Justify.
   (h) List the advantages of using sttellite system for television broadcasting.
   (i) List four different types of antennas used in satellite communication systems.
   (j) A satellite channel has 30MHz bandwidth.How many voice channels can be accommodated in

the carrier if FM is used for modulaton and bandwidth occupied by each channel is around 5 times the baseband bandwidth.

2. (a) Analyze how the process of total internal reflection provides a means for sending information over long distances using light energy. Thus show different modes in which light can propagate in optical fibers and list the characteristics of the fibers. (4
   (b) What is "V" number for optical fiber ? How is this parameter related to number of modes in a multimode fiber ?
   Determine the normalized frequency at 0.82 μm for a step index fiber having 25 μm core radius, $n_1 = 1.49$ and $n_2 = 1.46$ .How many modes will propagate through this fiber at 830nm and 1550nm wavelength ? (6
3. (a) With the aind of suitable diagram analyze the operation of edge emitting LED source. Discuss the reason for generation of in- coherent optical beam in theis device. Analyze the spectral characteristics of the llight output from this LED. (5
4. (a) An optical fiber communication system is to be designed with a laser transmitter transmitting odBn at 1300 nm wavelength.The cable are in rolls of 1 km with attenuation of 1dB/km. Each splice in the lick has a attenuation of 1dB and the insertion loss at the transmitter and receivers 2 dB each. The link should operate at 1 Gbps.Dettermine the least receiver sensitivity in a 6 dB margin is desired and the link is 20km in length.Make suitable assumptions if necessary. (5
   (b) Analyze with suitable figur eany one of the process

for manufacturing of single mode fibers.How can two fibers of similar types joined ? (5

5. (a) A typical geosynchronous satellite is located at 90^0 W longitude. Determine the look angle from earth station located at $125^0 W$ and $37^0 N$ .Also determine the northern most and the western most points where the satellite will be visible with an elevation of 25^0. (5

(b) Derive the relationship for revolution period of a satellite in terms of its height of deployment. Hence determine the height at which a geosynchronous satellite should be placed. (5

6. An satellite transmits a signal with 30 MHz bandwidth using 33 dBW carrier EIRP. A geosynchronous satellite at 36000km height is assumed using a carrier frequency 3900 MHz. Determine the C/N ratio if :

(i) Antenna diameter is 4m and 6m with 60% efficiency

(ii) Antenna noise temperature is 95 K

(iii) Receiver noise temperature 120K and 150 K

The wave guide loss and noise effects in wave guide can be neglected. Make suitable assumption if necessary. Derive the relationship used. (10

7. (a) List different multiple access techniques used in modern satellite systems.Analyze the YDMA system in detalis. How do multiple earth stations at different distances from satellite synchronize their traffic packets ? (5

(b) Draw the block diagram of a satellite earth station and discuss the functioning of each block . Discuss important features associated with each blocks. (5

8. Write short notes : (10

(a) Direct broadcast satellite TV.