Registration No: | | | | | | | | | | |

Total Number of Pages : 2

B.Tech.

CPEC5401

Seventh Semester Examination – 2010

COMMUNICATION SYSTEMS

Time: 3 Hours

Max. Marks: 70

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

The figures in the right-hand margin indicate marks.

1. a) How data rate of the fibre related to total dispersion? (2×10=20)

   b) Find the normalized difference between the core and cladding Δ is related to Numerical aperture(NA) (where η_1 and η_0 have their usual meaning).

   c) Compare between meridional and skew rays in a fibre.

   d) What you mean by 'acceptance angle' and 'acceptance cone' of a fibre ?

   e) Explain what you mean by polarization and its impact on satellite.

   f) Why communication satellites use different frequencies for uplink and for downlink? Which one is higher and Why?

   g) Contrast non-synchronous and synchronous satellites.

   h) Define effective isotropic radiated power.

   i) State the frequency range at which most of the direct broadcast satellite(DBS) operate.

   j) What do you understand by noise Equivalent power? Explain property.

2. a) Compare between step-index and graded-index fibre. (2)

   b) Compute the number of modes in a 50/125 graded index fibre having a parabolic index 2.0, μ 1=1.496 and μ 2=1.46 at an operating wavelength of 820nm and 1300nm. Also calculate the number of modes in an equivalent step index fibre at both wave length. (4)

   c) Calculate the fractional refractive index change and the largest core size for single mode propagation of GRIN fibre having a parabolic profile with m1=1.465 and m2=1.46 and operating wavelength =1250nm. Also compute the effective refractive index for the lowest mode. (4)

3. a) What are signal loss or attenuation mechanisms in a fibre? Describe. (3)

   b) A continuous 10 km long fibre link has a loss of 1.2 dB/km. i) Calculate the minimum optical power level that must be launched into the fibre to maintain an optical power level of 0.25 μ W at the receiving end. ii) What is the required input power if the fibre has a loss of 2.0 dB/km? Compare the results obtained in both case. (5)

   c) Calculate the critical radius of curvature for a multimode 50/125 fibre with an NA of 0.2 operating at 0.85 μ m wavelength (μ 1(core) =1.5 and μ 2=1.48). (2)

4. a) Explain principle of operation of Laser Diode. (3)

b) How much current would be developed in a PIN photodiode with a quantum efficiency of 80%, which illuminate with a 80 μ W of 1300nm photon. (3)

c) Calculate the amount of pulse spreading in pure silica for an LED operating at 0.82 μ m and having a 20nm spectral width. The path is 10km long. Also calculate the same if λ =1500nm and $\Delta\lambda$ =500nm. Given N(0.82 μ m) =110ps/(nm.Km), N(1.5 μ m) =15ps/(nm.Km). Symbols used have usual meaning. (4)

5. a) List and describe the advantages of geosynchronous satellite. (3)

b) A GEO satellite carries a C-band transponder which transmits 2W watts into an antenna with on axis gain of 32dB. An earth station is in the centre of the antenna beam from the satellite at a distance 38,000km. For a frequency of 4.2GHz calculate

i) The incident flux density at the earth station in watts per meter and dBW/m^2.

ii) The earth station has an antenna with a circular aperture 2.5m in diameter and aperture efficiency of 68%. Calculate the received power level in watts and in dBW, at the antenna out put.

iii) Calculate the on–axis gain antenna in decibels.

iv) Calculate the free space path loss between the satellite and earth station using the link equation. Give the answer in dBW. (7)

6. a) What do you understand by multiple access in the context of satellite communication? Give brief idea about the three basic multiple access techniques. State the basic difference between multiple access & multiplexing. (6)

b) Draw the block schematic diagram of a typical WDM network and explain in detail its principles of operation. (4)

7. a) Describe in detail typical features of VSAT and DBS System. (4)

b) The stations all operate in a TDMA mode. Speech signals are of 4khz sampled at Nyquist rate, using 8bits/sample.The sampled signals (PCM) are then multiplexed into 32-Mbps streams at each station, using QPSK. (6)

i) Find the bit rate for each PCM signal.

ii) The number of speech signals (as PCM) that could be sent by each earth station, as a single access with no overhead. This is a TDM data steam.

iii) The shortest frame time for any TDM scheme.

8. Write Short notes on any **four** (2.5×4)

a) link budget in Fibre optic link.

b) Transponder

c) Spread Spectrum

d) Dispersions.

e) Double Crucible Method.