**Total No. of Questions :8]**

**SEAT No. :** ____

**P3342**

**[Total No. of Pages : 3**

# [5670]-611
# B.E.(E/TC)
# BROAD BAND COMMUNICATION SYSTEMS
## (2015 Pattern) (Semester - II) (End Sem)

***Time : 2½ Hours]*** ***[Max. Marks : 70***

***Instructions to the candidates:***

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Black figures to the right indicate full marks.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume suitable data, if necessary.***
5) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***

***Q1)*** a) Compare single mode step index. Multimode step index and graded index fiber. Draw index profile for each fiber type. Also specify approximate core diameter. **[7]**

b) Explain link power budget for point to point optical fiber link. Write expression for power budget. **[7]**

c) Explain FBG & hence explain its usage as optical isolator **[6]**

OR

***Q2)*** a) Compare LED & LASER as light source for optical fiber transmission system. Justify usage for laser as light source along with single mode fibers. **[7]**

b) When the mean optical power launched into an 8km length of fiber is 120 μw, the mean optical power at the fiber output is 3μw determine **[7]**

i) The overall signal attenuation or loss in decibels through the fiber assuming there are no connectors or splices

ii) The signal attenuation per kilometer for the fiber

iii) The overall signal attenuation for a 10km optical link using the same fiber with splices at 1km intervals, each giving an attenuation of 1dB

iv) The input/out put power ratio in (iii)

c) Draw and explain 2 ×2 coupler. Write formulae to calculate splitting ratio, excess loss, insertion loss and cross talk. **[6]**

***P.T.O.***

***Q3)*** a) Compare LEO, MEO, GEO satellite orbits. State applications. Draw necessary diagrams. **[8]**

b) The earth rotates once per sidereal day of 23hr 56mins. Calculate radius of GEO.

Assume Radius of earth = 6400km

kepler's constant = $\mu = 3.986 \times 10^5$ $km^2$ N/kg Also calculate height of satellite from earth surface. **[8]**

OR

***Q4)*** a) Explain with diagram the following terms with respect to satellite communication. **[8]**

i) Apogee

ii) Perigee

iii) Zenith Direction

iv) Nadeer Direction

b) Describe the launch sequence used for satellite launching. **[8]**

***Q5)*** a) Explain Four types of antenna used for satellite communication. Draw & explain typical satellite antenna coverage zones. **[8]**

b) Draw and explain double conversion transponder for 14/11 GHz band. Specity frequencies at each block **[8]**

OR

***Q6)*** a) Explain with help of block diagram AOCS **[8]**

b) What is reliability & space qualification? Explain with bath tub curve. **[8]**

***Q7)*** a) Explain the following terms with mathematical equations with respect to satellite communication

i) Path loss

ii) EIRP

iii) C/N Ratio

iv) G/T Ratio **[8]**

b) A C-band earth station has an antenna with a transmit gain of 54dB. The transmitter output power is set to 100W at a frequency of 6.100GHz. The signal is received by a satellite at a distance of 37,500 km by an antenna with a gain of 26dB. The signal is then routed to a transponder with a noise temperature of 500K a band width of 36 MHz and gain of 110.dB.

calculate **[10]**

i) The path loss at 6.1 GHz, wavelength is 0.04918m

ii) The power at the out put port of the satellite antenna in dBW.

iii) Calculate the noise power at the transponder input, in dBW, in a band width of 36 MHz. Assume Boltzman's constant K = –228.6 dBW.

iv) Calculate C/N ratio, in dB, in the transponder.

OR

***Q8)*** a) What are different steps required for satellite downlink design? **[8]**

b) An uplink has following parameters as given below. Calculate carrier to noise ratio and flux density at the space craft. **[10]**

Transmit power = 29.3 dBW

Transmit Waveguide losses = 2dB

Transmit antenna gain = 50.6

Spreading Loss = 162.2 dB

Atmospheric Attenuation = 0.1dB

Free space loss = 200.4

Receive Antenna Gain = 26.3

Receive Waveguide Loss = 0.5

System noise temperature = 26.5 dBK

Boltzmann constant = –228.6 dBW/Hz/K

Band width (25MHz) = 74 dBHz