

CS/B.Tech/Even/ECE/8th Sem/EC-801C/2014

2014

Satellite Communication & Remote Sensing

Time Alloted : 3 Hours

Full Marks : 70

*The figure in the margin indicate full marks.
Candidates are required to give their answers in their
own words as far as practicable*

GROUP - A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following:

10x1=10

- i) What is the name of the world's first satellite
- a) Early Bird
 - b) Echo 1
 - c) Sputnik 1
 - d) INTELSAT 1
- ii) Rotation period of LEO satellite is
- a) 5-12 hour
 - b) 90 min
 - c) 24 hour

- d) both (a) & (b)
- iii) The eccentricity of an elliptical orbit with apogee and perigee distances can be calculated as
- $e = r_p / r_a$
 - $e = (r_a - r_p) / (r_a + r_p)$
 - $e = (r_a + r_p) / (r_a - r_p)$
 - $e = r_a / r_p$
- iv) Rapid fluctuations in attenuation are known as
- scintillation
 - depolarization
 - fades
 - cross talk
- v) The uplink frequency in DBS-TV transmission is
- 13-14.5 GHz
 - 14.5-14.8 GHz
 - 12.5-13.5 GHz
 - 15.5-15.8 GHz
- vi) The overall noise temperature T_e , absolute temperature T and noise figure F related as
- $T_e = T(F-1)$
 - $T_e = F(T-1)$
 - $T = T_e(F-1)$
 - $T_e = TF$
- vii) In satellite communication EM wave propagates as
- Ground wave
 - Sky wave

- Tropospheric wave
 - Through ionosphere and space
- viii) Earth station figure of merit is defined as
- $10 \log (G/T)$
 - $10 \ln (G/T)$
 - $10 \log GT$
 - $20 \log (G/T)$
- ix) The point in the orbit where the satellite is closest to the earth is called
- focus
 - apogee
 - orbital height
 - perigee
- x) Signal attenuation due to rain is obtained in
- C band
 - Ku band
 - L band
 - X band
- xi) A passive microwave sensor is
- RMSR
 - MSMR
 - SMSR
 - MMSR
- xii) Terrestrial satellites are used to obtain
- Earth's weather
 - Earth's land surface

- c) Earth's oceans
d) None of these
- xiii) Precise measurement of Earth features can be obtained by
- high oblique photographs
 - low oblique photographs
 - vertical aerial photographs
 - all of these
- xiv) Polarization refers to the orientation of the
- E field
 - H field
 - E-H field
 - Transverse E field
- xv) In thermal remote sensing, sensors record objects emitted energy. The amount of energy radiated is expressed as
- Plank's law
 - Stefan Boltzmann law
 - Kepler's third law
 - Snell's law

GROUP - B
(Short Answer Type Questions)

Answer any *three* of the following. 3x5=15

2. a) State Kepler's three laws of planetary motion.
b) Define the terms i) Apogee & Perigee, ii) Elevation angle & azimuth angle, iii) Sub satellite point
2+3=5
3. a) Briefly discuss, how does the solar eclipse affect the working of a communication satellite?
b) What do you understand by sun-transit outage?
3.5+1.5=5
4. a) Define what is meant by remote sensing?
b) How is active remote sensing different from passive remote sensing?
2+3=5
5. a) What is a spectral signature in remote sensing?
b) How it is changed with wavelength in case of water?
2+3=5
6. a) What is Tropical Rainfall Measuring Mission?
b) Write in brief about AURA satellite mission.
2.5+2.5=5

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GROUP - C**(Long Answer Type Questions)**Answer any *three* of the following. 3x15=45

7. a) What are the basic elements of satellite communication system? Explain with a suitable block diagram.
 b) What is meant by orbit perturbations? Explain in brief.
 c) Determine the average angular velocity of a satellite moving in an elliptical orbit. If the semi major axis is 42164.8 km and orbital eccentricity is 0.0011. Given $G = 6.67 \times 10^{-11} \text{ m}^3 \text{kg}^{-1} \text{s}^{-2}$
 $M = 5.98 \times 10^{24}$
 d) What do you mean by Geostationary orbit? 5+5+3+2 = 15
8. a) Describe the telemetry, tracking and command facilities of a satellite communication system.
 b) What is attitude control subsystem? Explain how it perform its function.
 c) Define transponder. 7+6+2=15
9. a) What is Friis transmission equation?
 b) What do you understand by G/T ratio? Prove that C/N at the input of a detector in the receiver is proportional to G/T.
 c) Thermal noise in an earth station receiver results in a $(C/N)_{dn}$ ratio of 20.0 dB. A signal is received from a bend pipe transponder with a carrier to noise ratio $(C/N)_{up} = 20.0 \text{ dB}$. What is the value of overall $(C/N)_o$ at the earth station? If the transponder introduces intermodulation products with (C/I) ratio = 24 dB, what is the overall $(C/N)_o$ at the earth station?
 d) What do you mean by Time Division Multiple Access? With the help of proper diagram discuss TDMA frame structure and TDMA burst structure.

- e) Mention two disadvantages of FDMA.

2+2.5+3.5+5.5+1.5=15

10. a) Describe advantages and limitations of remote sensing.
 b) How sea surface temperature can be measured in remote sensing?
 c) Mention two strengths and weakness in thermal infrared sea surface measurement technique.
 d) What is scatterometry and how it works? 4+4+2+5=15
11. a) What are the different types of sensor resolution in remote sensing?
 b) Describe the spectral and radiometric resolution.
 c) What is electromagnetic spectrum?
 d) What are the major wavelength ranges used for remote sensing?
 e) Define IFOV in the context of remote sensing. 1+9+2+ 1.5+ 1.5=15

12. Write short notes on any three of the following:

3x5=15

- a) Comparative study between LEO, MEO & GEO
 b) Code Division Multiple Access
 c) Effect of Rain on satellite signal propagation
 d) Weather surveillance radar
 e) Microwave Limb Sounder in AURA satellite
 f) LIDAR in atmospheric remote sensing meteorology