REMOTE SENSING USING SATELLITES
(ECEN 4241)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i)   The interaction of the electromagnetic radiation produced with a specific wavelength to illuminate a target on the terrain for studying its scattered radiance, is
(a) passive remote sensing   (b) active remote sensing
(c) neutral remote sensing   (d) none of the above.

(ii)   Consider the following statements regarding the satellite imaging:
1. The satellite orbit is fixed in the inertial space.
2. During successive across-track imaging, the earth rotates beneath the sensor.
3. The satellite images a skewed area.
Which of the above statements are correct?
(a) 1 and 3   (b) 1 and 2
(b) 2 and 3   (d) All of the above   .

(iii)   What is the radius of a circular orbit from the centre of earth for which the period is 1 day?
(a) 42.241 km   (b) 42.241m
(c) 4.241km   (d) 2.241km.

(iv)   One component of remote sensing is
(a) energy source or Illumination   (b) audio signal
(c) MASER   (d) none of these.

(v)   Ability of a remote sensor to distinguish between two objects spaced apart is known as
(a) spectral resolution   (b) spatial resolution
(c) temporal resolution   (d) radiometric resolution.

(vi)   Speckle in a radar image occurs mainly due to
(a) Faraday rotation of the EM wave
(b) scintillation
(c) constructive and destructive interference from scattered waves
(d) the surface roughness of earth.

(vii)   MEGHA - TROPIQUES is to
(a) study water cycle and energy exchanges
(b) do surveillance of neighbours
(c) map tropical forests
(d) aid military ground camps.

(viii) With the increase of turbidity, the muddy water appears brown due to the shift of the upward radiance peak towards
(a) blue   (b) green   (c) red   (d) yellow.

(ix)   Radiant energy is termed as irradiance when
(a) it falls on a surface   (b) it is measurable
(c) it is high in magnitude   (d) it relates to active sensing system.

(x)   Which of the following remote sensing system can be used to measure wind speed?
(a) Synthetic Aperture Radar   (b) SODAR
(c) Side Looking Airborne Radar   (d) LANDSAT-MSS.

Group – B

2. (a) Describe the interaction process of EM Radiation with the target and remote sensing satellite.

(b)   Write a short note on what you understand by the "resolution of a sensor". Briefly describe the various resolutions a remote sensor analyst has to deal with.

4 + 8 = 12

3. (a) A geo satellite at a distance of 36,000 km from the surface of the earth radiates a power of 10W in the desired direction through an antenna having a gain of 20dB. What would be the power density at a receiving site on the surface of earth, and also the power received by an antenna having an effective aperture of 10 m^2?

(b) With the help of a wavelength vs atmospheric transmission diagram , analyze the concept of atmospheric windows and its significance in remote sensing.

6 + 6 = 12

Group – C

4. (a) Highlight the differences between passive and active microwave remote sensors. Provide a list of satellites that operate in each category.

(b) List the differences between airborne radar systems and spaceborne radar systems.

(c) Highlight the importance of using ground based data in remote sensing data analysis.

4+ 4 + 4 = 12

5. (a) Identify the global system which is used by Radio Occultation (RO) technique. List the application areas of RO with a brief description of the process involved.

(b) Explain the concept of thematic mapping with remote sensed data.

(1+ 2+ 4) + 5 = 12

Group – D

6. (a) List the salient features of spatial, radiometric and temporal resolution techniques used with satellite mounted remote sensors.

(b) What are the various types of data acquisition platform? Briefly describe the characteristics of different types of platform.

6 + (2 + 4) = 12

7. (a) Write a short note on the thermal properties of water and land from the perspective of a remote sensing satellite.

(b) Explain in brief the different types of scanning techniques employed for imaging. List an example for each type.

6 + 6 = 12

Group – E

8. (a) With an appropriate example discuss India's efforts to study tropical climate dynamics.

(b) What are the available technologies to perform oceanographic studies? Give a short description of each technology.

6 + 6 = 12

9. (a) Describe a satellite TTR station and identify the various aspects of the same.

(b) Explain the concept of LIDAR as used in various atmospheric detection and measurement.

6 + 6 = 12