TC-118

April-2013

M.Sc. Sem. II

410 : Physics

(Remote Sensing and Electronics)

Time : 3 Hours]   **[Max. Marks : 70**

Instructions : (1)   **All** symbols carry usual meanings.
                        (2)   Attempt **all** questions.
                        (3)   Scientific calculators are allowed.

1. (a)   Describe in detail how Earth's atmosphere affects remote sensing from space.   **7**

OR

What is meant by spectral signature ? Describe the spectral signatures of vegetation and water bodies in the visible-IR (0.3 to 3 μm) spectral range. What are the physical basis for this signatures ? How healthy and unhealthy vegetation can be discriminated using spectral signature.

   (b)   Discuss the different platforms employed in Remote Sensing stating their advantages and disadvantages. Describe the whiskbroom and pushbroom scanning techniques used for remote sensing.   **7**

OR

Describe range and azimuth resolution of a Side Looking Airborne Radar (SLAR). Explain in detail how the range and azimuth resolutions vary over the swath of a SALR.

2. (a)   What are the advantages of digital image processing compared to visual image processing. Describe various elements of visual image interpretation. What is meant by interpretation keys ?   **7**

OR

What is meant by digital image and histogram of an image. Describe with equations wherever applicable the different image enhancement techniques.

   (b)   What is meant by spatial frequency ? Based on spatial frequency distinguish between rough and smooth textures in image. Discuss the concept of convolution and spatial filtering ? With help of examples discuss various methods of spatial filtering.   **7**

OR

Describe supervised and unsupervised classification used in remote sensing, mention their merits and demerits.

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3. (a) Using N-channel JFET, draw circuit of common source amplifier and obtain the expressions of voltage gain, input and output resistances at mid frequencies. **7**

OR

Give the constructional details of JFET and explain its working principle.

   (b) Give the details of construction of depletion type N-channel MOSFET. Draw its drain characteristics and transfer characteristics. **7**

OR

Explain the effect of drain to source voltage (Vds) on channel conductivity of N-channel JFET with suitable diagrams.

4. (a) Draw schematic circuit diagram of 2-input NMOS-NAND gate and explain its working by verifying the truth table. **7**

OR

Discuss the following terms for digital ICs :
   (i) Propogation delay
   (ii) Noise Immunity
   (iii) Power Dissipation

   (b) Describe the three different methods to interface TTL driver ICs to CMOS load ICs. **7**

OR

What is meant by sourcing and sinking currents ? Discuss standard loading rules for TTL ICs.

5. Answer the following : (**One mark each**) **14**
   (a) Draw the Planck's spectral distribution curve for sun and that of earth surface.
   (b) Suppose you have a digital image which has a radiometric resolution of 10 bits. What is the maximum value of the digital number which could be represented in that image ?
   (c) A surface is having average height variation of 5 mm. Using Rayleigh Criteria, verify whether the surface is rough or smooth for vertically falling (i) visible radiation (ii) microwave radiation.
   (d) What is the major limitation of SLAR ?
   (e) Obtain Rayleigh-jeans approximation from the Planck's equation.
   (f) What is meant by sun synchronous orbit ?
   (g) List the three image data re-sampling techniques.
   (h) List the two advantages of digital ICs.
   (i) Draw the symbol of Dual gate P-MOSFET.
   (j) Draw static characteristics of JFET and show "PINCH OFF Region" ?
   (k) The ICs of CMOS family have lowest power dissipation. True or False.
   (l) Three CMOS devices are cascaded. If each has got the propagation delay time of 100 ns, what is the total propagation delay time ?
   (m) Write two advantages of ECL ICs.
   (n) FET is a Voltage controlled device. True or False.

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