

Seat No. : _____

ZS-109

May-2014

M.Sc., Sem.-II

410 : Physics

(Remote Sensing and Electronics-II)

Time : 3 Hours]

[Max. Marks : 70

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

1. (a) With help of suitable sketches and equations, explain Plank's law, Wein's displacement law and Stephan Boltzman's law. **7**

OR

- (i) What are the advantages and disadvantages of remote sensing from space ? **3**
(ii) Explain what is meant by sun synchronous orbit and geostationary orbit. What are the basic requirements ? Compare merits and demerits of each in relation to earth observations. **4**
(b) Discuss briefly the four resolutions used in remote sensing. Optimum spatial resolutions of a sensor depends on the theme of interest, discuss with suitable examples. **7**

OR

- (i) Derive an expression for velocity and period of revolution of a satellite in circular orbit. Obtain velocity and time period of satellite in (i) 1000 km height, (ii) geostationary orbit. **3**
Mass of earth = 5.974×10^{24} kg,
Gravitation constant = $6.672 \times 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2}$
(ii) Based on radar range equation, obtain an expression for backscattering coefficient. Discuss different factors affecting backscattering coefficient. **4**

2. (a) (i) Discuss various elements of visual image interpretation. **4**
(ii) What are the advantages of digital image interpretation over visual image interpretation ? **3**

OR

- (i) In relation to remote sensing, what are interpretation keys ? How are they used ? **3**
(ii) Describe in detail about histogram equalization technique. **4**

- (b) Describe various steps involved in geometric registration, with special emphasis to different resampling techniques. 7

OR

Describe briefly different schemes (techniques) used for supervised classification.

3. (a) List various JFET parameters and discuss the effect of temperature on these parameters. 7

OR

Giving suitable diagrams, discuss the effect of drain to source voltage (V_{ds}) on channel conductivity of JFET.

- (b) Give the constructional details of Enhancement type MOSFET and draw its drain characteristics and transfer characteristics. 7

OR

Draw circuit of common-Gate amplifier using JFET and obtain the expressions of voltage gain, input and output resistance at mid frequencies.

4. (a) Draw the schematic diagram of standard TTL-NAND gate with totem-pole connection and explain how does it work ? 7

OR

List the advantages of CMOS ICs. Draw schematic circuit diagram of 2-input CMOS - NAND gate and explain its working by verifying the truth table.

- (b) Describe three methods to interface CMOS driver 1C to TTL load 1C. 7

OR

Write a note on I^2L logic family.

5. Attempt **all** questions (One mark each). 14

- (i) Wavelength region around $10\ \mu\text{m}$ is very extensively used for remote sensing, why ?
- (ii) Which of the following wavelength band is most suitable for discriminating snow and cloud ?
(A) Blue (B) Green (C) Red (D) Infrared
- (iii) Why vegetation appears to be red in FCC ?
- (iv) For a particular gray body, the emissivity ____ with wavelength.
(A) remains constant (B) increases
(C) decreases (D) varies between 0 and 1
- (v) Theoretical limit of resolving two objects by an imaging system is set by _____.
(A) diffraction (B) reflection (C) refraction (D) polarization

- (vi) If modulation transfer function (MTF) is equal to one, what does it mean ?
 - (vii) Compare temporal resolutions of IRS and INSAT satellites.
 - (viii) List the different types of TTL ICs.
 - (ix) Why MOSFETS should be handled with care ?
 - (x) A Depletion type MOSFET has a Induced channel . (TRUE OR FALSE)
 - (xi) Show “OHMIC region” in the static characteristic of JFET.
 - (xii) Define “Power dissipation” for digital ICs.
 - (xiii) Write three advantages of ECL IC’s .
 - (xiv) List two disadvantages of JFET over Bipolar transistor.
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