

Seat No. : \_\_\_\_\_

# AE-137

April-2019

M.Sc., Sem.-II

410 : Physics

(Remote Sensing and Electronics-II)  
(Old)

Time : 2:30 Hours]

[Max. Marks : 70

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

1. (A) (i) With help of equations and sketches discuss major black body radiation laws relevant to remote sensing. 7
- (ii) Describe in detail about radiometric resolution of a remote sensing system. How is it different from spectral resolution ? 7

**OR**

- (i) Discuss in detail about three different modes of imaging. Mention their merits and demerits.
  - (ii) What are the major advantages of microwave remote sensing ? What is Rayleigh- Jeans approximation ? Obtain an expression for it from Plank's law. With help of examples discuss how is it useful in remote sensing ?
- (B) Attempt any **four** questions from below : 4
- (i) What will be wavelength of peak emission from a black body having temperature of 1000 °K ?
  - (ii) What is meant by spectral signature ?
  - (iii) How stressed vegetation can be distinguished from healthy vegetation using NDVI ?
  - (iv) For a given wavelength, what are the two important parameters which influence reflectance from water bodies ?
  - (v) What do you understand by spatial resolution ?
  - (vi) Why real aperture radar in space-borne platforms is not much useful in remote sensing applications ?

2. (A) (i) What do you understand by image enhancement ? Mention major techniques used for image enhancement. Describe any one method used for image enhancement in detail. 7
- (ii) What is meant by image classification ? Discuss the concept of supervised classification. Name different algorithms used for supervised classification. 7

**OR**

- (i) Discuss in detail why image restoration of the acquired images is needed. How is it achieved ?
- (ii) What is meant by spatial frequency ? With help of examples describe the concept of convolution used for spatial filtering.
- (B) Attempt any **three** from the following : 3
- (i) Give an example of a mask that can be used for high pass filtering.
- (ii) What is meant by GCP (Ground Control Point) ?
- (iii) Why vegetation appears to be red in standard FCC ?
- (iv) Mention two important advantages of digital image interpretation over visual image interpretation.
- (v) What will be the range of DN values for a system having 10 bit radiometric resolution ?

3. (A) (i) Discuss the operating principle of JFET. Define important JFET parameters. 7
- (ii) Draw circuit of common gate amplifier using JFET and derive the expressions for its voltage gain, input and output resistances. 7

**OR**

- (i) Give the details of construction and working of Enhancement type N-channel MOSFET. Draw its output and transfer characteristics.
- (ii) With suitable diagrams explain the effect of drain to source voltage ( $V_{DS}$ ) on channel conductivity of N-channel JFET.

(B) Attempt any **four** from the following : (**one** mark each)

**4**

- (i) Why JFET is called an “Unipolar” device ?
- (ii) For a JFET  $I_{GSS} = 15 \text{ nA}$  at  $V_{GS} = -10 \text{ Volts}$  and  $V_{DS} = 0 \text{ Volts}$ .  
The input resistance from Gate to Source is \_\_\_\_\_.
- (iii) Show “Pinch Off region” in the static characteristic of JFET.
- (iv) FET is a Voltage controlled device. **TRUE** or **FALSE**.
- (v) Input impedance of Common drain Amplifier is low. **TRUE** or **FALSE**
- (vi) Draw symbol of depletion type N-MOSFET.

4. (A) (i) List the important features of MOS ICs. Draw schematic circuit diagram of 2-input NMOS-NOR gate and explain its working by verifying truth table.

**7**

(ii) Discuss how TTL driver IC can be interfaced with CMOS load IC. Describe any two methods of interfacing TTL driver ICs to CMOS load ICs.

**7**

**OR**

- (i) Explain the concept of sourcing and sinking currents in TTL ICs ? Discuss standard loading rules for TTL ICs.
- (ii) Draw schematic circuit diagram of 2-input CMOS-NAND gate and explain its working by verifying the truth table.

(B) Attempt any **three** from the following : (**one** mark each)

**3**

- (i) List the different types of TTL ICs.
  - (ii) The ICs of CMOS family have lowest power dissipation. **TRUE** or **FALSE**.
  - (iii) What is meant by Fan out of digital ICs ?
  - (iv) Draw circuit of CMOS inverter.
  - (v) Three CMOS gates are cascaded. If each has got the propagation delay time of 20ns, what will be the total propagation delay time ?
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- (v) What will be the range of DN values for a system having 10 bit radiometric resolution ?

3. (A) (i) Draw circuit of common gate amplifier using JFET and derive the expressions for its voltage gain, input and output resistances. 7
- (ii) Describe the structure and working principle of Light Emitting Diode (LED) by giving necessary diagrams. 7

**OR**

- (i) How is MOSFET different from JFET ? Give details of construction and working of Enhancement type N-channel MOSFET. Explain its output and transfer characteristics.
- (ii) How is solar cell different from a photodiode ? Discuss the structure of a basic solar cell and draw its I-V characteristics under illumination. Define fill factor of a solar cell.
- (B) Attempt any **four** from the following : (**one** mark each) 4
- (i) Photodiode is always forward biased. TRUE or FALSE,
- (ii) For a JFET  $I_{GSS} = 15 \text{ nA}$  at  $V_{GS} = -10 \text{ Volts}$  and  $V_{DS} = 0 \text{ Volts}$ .  
The input resistance from Gate to Source is \_\_\_\_\_.
- (iii) Show “Pinch Off region” in the static characteristic of JFET.
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