

M.Sc. Sem.-4 Examination

510

Physics

Time : 2-30 Hours]

April-2025

[Max. Marks : 70

- Q.1 (A) Explain remote sensing system among them write in detail on data acquisition, data processing analysis. [07]
- (B) State the types of remote sensing and write applications, advantage of remote sensor and limitations with satellite measurements. [07]
- OR
- Q.1 (A) Define black body and explain Stefan-Boltzman law, Wein displacement law and Plank's law – spectral emittance in black body in detail. [07]
- (B) Write optical and microwave range for Electro Magnetic spectrum for remote sensor. What do you mean by selective absorber? Explain scattering and absorption in detail. [07]
- Q.2 (A) Discuss different types of intensity transformation functions used in image processing. [07]
- (B) What is the difference between Simple Vegetation Index and Normalized Difference Vegetation Index? Explain both terms in detail. [07]
- OR
- Q.2 (A) Discuss the basics of remote sensor in detail. [07]
- (B) What is the difference between aerial and satellite imagery? Discuss Different types of aerial photography drawing necessary figures and discuss their features. [07]
- Q.3 (A) What is AGC? Why is it needed in receiver? Draw the circuit of practical diode detector and discuss its working. [07]
- (B) For AM receiver, derive the expression for signal to noise ratio at the reference and at the output. [07]
- OR
- Q.3 (A) State the advantage of having RF stage in superheterodyne AM receiver. Draw the circuit diagram of a typical RF stage. What is image frequency? [07]
- (B) Draw circuit of IF amplifier in a superheterodyne receiver and explain its characteristics. [07]
- Q.4 (A) Explain in detail, "A-scope Display". [07]
- (B) Explain in detail, [07]
- (a) Write the working of, "CW Doppler radar".
- (b) Obtain relative velocity(v_r) of target using Doppler effect.
- OR
- Q.4 (A) Explain in detail, "radar BEACON". [07]
- (B) Explain in detail monopulse tracking system. [07]
- Q.5 Answer in brief Any Seven questions: (Each question is of two marks). [14]
- (i) Write the solar energy is subjected to modification by several physical processes as it passes through the atmosphere.
- (ii) The relationship between reflectance, absorptivity and transmittance was given

- by $\rho(\lambda) + \alpha(\lambda) + \tau(\lambda) > 1$. [TRUE/FALSE]
- (iii) The emissivity characteristics of material can be for black body is _____ at all wavelength.
- (iv) Red (or visible) reflectance is sensitive toand the near-infrared reflectance is sensitive to the of leaves.
- chlorophyll content, mesophyll structure
 - mesophyll structure, chlorophyll content
 - soil, water
 - water, soil
- (v) is the process of alignment of an image to a map, whereas is the process of alignment of one image to another image of the same area.
- Registration, Rectification
 - Rectification, Registration
 - Registration, Geocoding
 - Geocoding, Ortho-rectification
- (vi) The negative of an image with intensity levels in the range $[0, L - 1]$ is obtained by using the negative transformation function of the form:
- $s = L + 1 - r$
 - $s = L - 1 - r$
 - $s = L + r$
 - $s = L - r$
- (vii) In a radio receiver,
- all stages contribute equally to noise
 - RF stage has no effect on S/N ratio
 - mixer stage contributes most of the noise generated
 - AF stage contributes most of the noise generated
- (viii) In superheterodyne reception, the local oscillator is used to
- detect the modulating signal
 - amplify the received modulated carrier
 - demodulate the modulating signal
 - shift the frequency of the modulated carrier to band
- (ix) If β is the modulation index in FM, the improvement in the output S/N power ratio is proportional to
- β
 - β^2
 - β^3
 - $1/\beta$
- (x) How the bright-spot did appear at any point on the PPI screen for indication of target?
- (xi) What is the purpose of using *cascade of tuned amplifier* in the receiver assembly of pulsed radar system?
- (xii) How Cross-section area affect the range of the radar?