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0504N97

Candidate's Seat No :_____

M.Sc Semester-4 Examination

510

Physics

April-2024

Time : 2-30 Hours] **[Max. Marks : 70**

Instructions:

i. Attempt all questions.

ii. Symbols have their usual meanings

Q-1 (A) With help of equation and a sketch describe Planks law of thermal radiation. Using the same sketch explain Wien's displacement law and Stephan Boltzmann law. 7

(B) What do you understand by spectral signature? Discuss importance of spectral signature studies. With help of sketches of spectral signatures discuss how the following can be distinguished (i) deceased crop and healthy crop (ii) artificial turf and natural grass. 7

OR

Q-1 (A) Briefly describe four resolutions associated with sensors in remote sensing. Discuss why there is a need for a trade-off (compromise) between different resolutions. 7

(B) Briefly explain the following 7
(i) Advantages and limitations of space based remote sensing.
(ii) Applications of remote sensing in urban planning or disaster management
(iii) Resourcesat

Q-2 (A) Briefly describe the following 7
i) Real color image & FCC image
ii) Histogram equalization
iii) Band (spectral) ratioing

(B) Explain in detail about spatial frequency and spatial frequency filtering in the context of in image processing. 7

OR

Q-2 (A) Describe the concept of linear stretching used for image enhancement. 7

(B) Discuss why is it important to have geometric correction on remote sensing data, how is it achieved? 7

Q-3 (A) Describe the general process of a superheterodyne receiver's frequency variation. Which devices are some examples of those that can be utilised as frequency changers? Does each of them need to be thrilled separately? 7

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(B)	Find the expression for signal to noise (S/N) ratio at the reference and the output for FM receiver.	7
	OR	
Q-3 (A)	Obtain the expression for signal to noise (S/N) ratio at the reference and the output for AM receiver.	7
(B)	What is the principle of superheterodyne? Give a brief explanation of each superheterodyne AM receiver block's purpose. List both the benefits and drawbacks.	7
Q-4 (A)	Discuss in detail - Moving Target Indicator (MTI) radar.	7
(B)	(a) Write in detail the working of, "CW Doppler radar". (b) Obtain relative velocity(v_r) of target using Doppler effect.	7
	OR	
Q-4 (A)	Obtain equation of radar range (R_{radar}) and discuss factors affecting on it.	7
(B)	Explain in detail monopulse tracking system.	7
Q-5	Attempt any **SEVEN** questions. All carries TWO marks.	14
i	What do you understand by atmospheric window?	
ii	What is the sensor used in Indian Cartosat satellite? What are its disadvantages?	
iii	What is the advantage of hyperspectral sensors compared to multispectral sensors?	
iv	Which element of image interpretation is useful to discriminate wheat field from cotton field ?	
v	What do you understand by raster data?	
vi	Mention two major advantages of digital image processing compared to visual image processing	
vii	An AM receiver has RF stage with loaded Q of 100. If intermediate frequency (f_I) is 455 kHz, then calculate image frequency and its rejection ratio at signal frequency (f_S) of 1500 kHz.	
viii	Which method is more preferable for AM carrier transmission? Why?	
ix	Define the terms: sensitivity and selectivity.	
x	If somehow radar designer adjusted the radar repeater frequency about 9000pps, then find out the unambiguous radar range?	
xi	What is the purpose of using cascade of tuned amplifiers in the receiver assembly of pulsed radar system?	
xii	What are the improvements required for better A-scope display presentation?	

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M. Sc. (PHYSICS) SEM-IV Examination, April – 2024

PHY-510 Electronic Communication – II (OLD COURSE)

Total marks : 70 **Duration : 2 hrs 30 mts**

Instructions: (1) Attempt All Questions.
(2) Symbols and terminology have their usual meaning.

Q.1	(A)	Explain the following terms: (A) Primary line parameters (B) VSWR (C) Reflection coefficient	[07]
	(B)	Derive an expression for input impedance of a transmission line as a function of length.	[07]
		OR	
Q.1	(A)	Draw the circuit approximation of a section of a transmission line. Obtain expressions for velocity of propagation, line wavelength and characteristic impedance for two wire line in terms of these parameters.	[07]
	(B)	What is Smith chart? Discuss important properties of Smith chart.	[07]
Q.2	(A)	Explain the principle, structure and important properties of Parabolic reflector antenna.	[07]
	(B)	Write a detailed note on: log periodic antenna.	[07]
		OR	
Q.2	(A)	Explain the principle, structure and important properties of Yagi - Uda antenna.	[07]
	(B)	Describe the similarities and dissimilarities between the end fire and the broad side array antennas.	[07]
Q.3	(A)	For AM receiver, obtain the formula for signal to noise (S/N) ratio at the reference and at the output.	[07]
	(B)	Discuss the need of AGC in a receiver. Draw circuit and characteristic curve of an AGC system.	[07]
		OR	
Q.3	(A)	Draw the block diagram of a super heterodyne FM receiver. Compare the differences and similarities between AM and FM super heterodyne receiver.	[07]
	(B)	Draw circuit of IF amplifier in a super heterodyne receiver and explain its characteristics.	[07]
Q.4	(A)	Write short note on : CW Doppler Radar.	[07]
	(B)	Explain conical switching for tracking method of radar, draw necessary block diagram.	[07]
		OR	
Q.4	(A)	Discuss in detail, "FMCW radar".	[07]
	(B)	Write short note on: PPI display system.	[07]

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Q.5 Answer **Any Seven** questions from the following: (Each question is of **two** marks). [14]

(i) What do you understand by matched load?

(ii) What is the use of a quarter wave transformer?

(iii) What is the characteristic impedance of a loss less transmission line having L = 115 nH/m and C = 20 pF/m?

(iv) What is isotropic antenna?

(v) What is called Fraunhofer region?

(vi) What are the types of microwave antennas?

(vii) What do mean by selectivity of a receiver?

(viii) What is image frequency?

(ix) In super heterodyne FM receiver, the AGC is taken from amplitude limiter circuit. (TRUE or FALSE)

(x) What is the full form of STALO?

(xi) What is blind speed?

(xii) Write advantages of monopulse tracking system.

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