Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

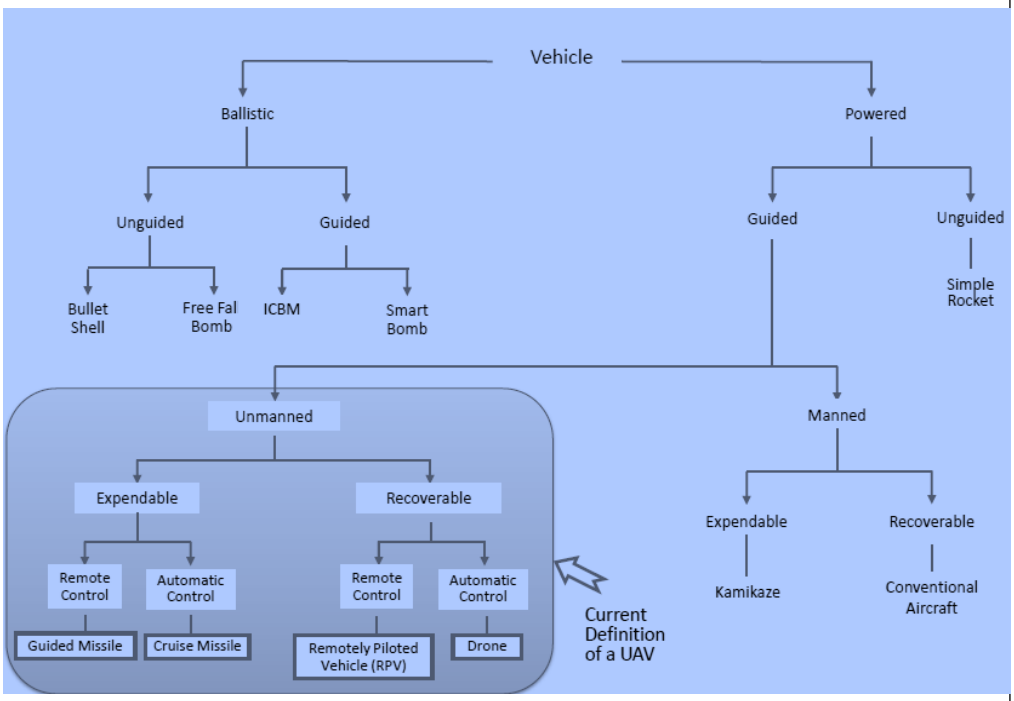
Programme Name: M.Tech ASE+UAV **Semester : III**
Course Name : Remote Sensing & Surveillance **Time : 03 hrs**
Course Code : MAEG 831 **Max. Marks : 100**
Nos. of page(s) : 03

Instructions:

1. **No students will be allowed to leave the examination hall before 1hr.**
2. **Assume any missing data with suitable explanation.**

SECTION A

S. No.		Marks	CO
Q 1	Define the basic principle of UAV remote sensing.	**4**	**CO1**
Q 2	What is the major difference between multiple spectral remote sensing and hyperspectral remote sensing?	**4**	**CO2**
Q 3	What is the major difference between thermal infrared remote sensing (3 -100 µm) and visible and near infrared (0.4 – 2.5 µm) based remote sensing.	**4**	**CO3**
Q 4	With neat sketch diagram, define the term "Swath" used in remote sensing.	**4**	**CO1**
Q 5	What is the fundamental principle of Synthetic Aperture RADAR?	**4**	**CO4**
	SECTION B		
Q 6	List out the ten difference between supervised and unsupervised image classifications specifically in remote sensing technologies.	**10**	**CO2**
Q 7	Differentiate the four different types of the resolutions with the schematic diagram and classify the signal signature properties in each one of them.	**10**	**CO2**
Q 8	Describe the principle of "Whiskbroom" and "Pooshbroom" sensors used in the remote sensing technologies for the various applications in Land/Ocean observations.	**10**	**CO3**
Q 9	a) A radar operates at 10 GHz with the transmitter power of 10 KW. The radar signal is reflected from a target, which is at a distance of 20 km. The radar cross section of the target is 10 m^2 . The gain of antenna is 20 dBi. Find the received signal power. b) Pulse radar transmits pulses whose pulse width is 1.2 µs. The reception rate of pulse is 0.8 kHz. Determine the minimum and maximum ranges of the radar. c) The noise figure of a radar receiver is 9 dB and if bandwidth is 2 MHz. find its minimum receivable signal. ***OR***	**10**	**CO3**

	Explain the principle of working of Synthetic Aperture RADAR. Also define the data matrices used in the formation of grayscale images and RGB images.		
SECTION-C			
Q 10	What is the difference between RADAR, SAR and SLAR? Define the properties of each sensor and systems. How aperture formation takes place? How SAR can be useful in image formation with reference to the signal processing. Describe the various SAR data formats. How raw data is differed from the geocoded processed images. Describe the formulations correlated in azimuth and range resolutions. Why the aperture antenna is differs from the real antenna of the SAR?	**20**	**CO3**
Q 11	Explain all the parameters of UAS classification and types as shown in Figure 1.  ***Figure 1*** ***OR*** The Figure 2 below shows the Landsat-D mapping geometry. The background image is the earth surface. A Landsat track from north to south is shown on the earth surface. Scan width, swath width, spatial resolution, the altitude of the satellite are all shown in the Figure 2. Please answer the following questions: a. Based on the figure 1, what is the scanning configuration of the system b. What is the type of orbit of the satellite?	**20**	**CO1**

c. How many pixels each scan line has?
d. If the satellite moves at a speed of about 7 km/second, how many scans will be in each second?
e. how much the scan frequency (Hz) will be?
f. What is the dwell time?
g. Calculate the dwell time of this system
h. Do you think this system has good dwell time or bad dwell time?
i. We know this landsat has seven bands, and radiometric resolution of the image is 8 bits, what is the data stream per second?

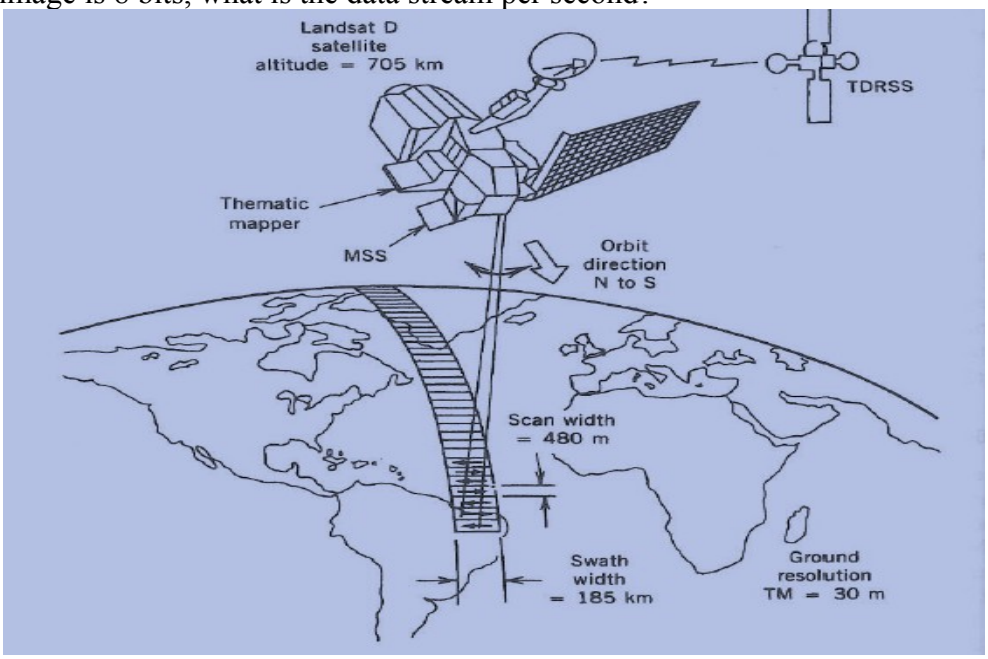


Figure 2

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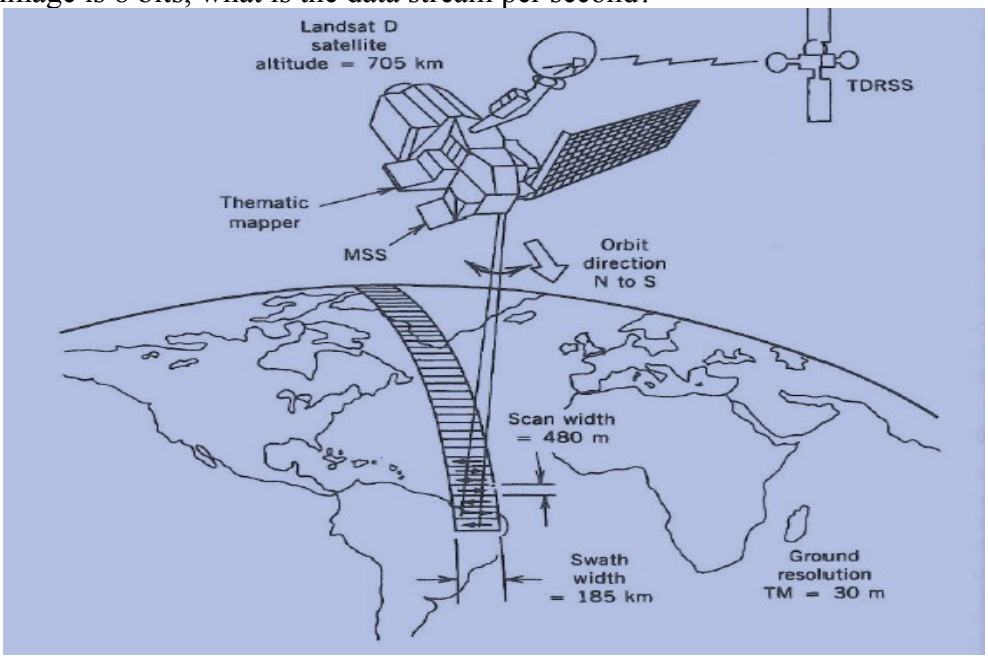
SECTION A

S. No.		Marks	CO
Q 1	Define the term "Remote Sensing". Explain the different types of active and passive sensors	4	CO1
Q 2	Explain "Pooshbroom" and "Whiskbroom" sensor for the scanning of the satellite for the Earth observations	4	CO3
Q 3	Discuss the various types of data processing units in the remote sensing technologies	4	CO4
Q 4	Define SNR used for the SAR/RADAR operation in the active remote sensing technologies	4	CO3
Q 5	Dictate the term geocoding used for the conversion of digital image pixel to the earth coordinate systems.	4	CO1
	SECTION B		
Q 6	Distinguish between sun-synchronous, non-sun-synchronous, polar and geostationary satellites. Explain the advantages and disadvantages for each one of them	10	CO1
Q 7	What is the main difference with the sensors used in Land Observation Satellite to that of the sensors used in Marine Observation Satellite?	10	CO2
Q 8	a) A radar operates at 10 GHz with the transmitter power of 10 KW. The radar signal is reflected from a target, which is at a distance of 20 km. The radar cross section of the target is 10 m^2 . The gain of antenna is 20 dBi. Find the received signal power. b) Pulse radar transmits pulses whose pulse width is 1.2 µs. The reception rate of pulse is 0.8 kHz. Determine the minimum and maximum ranges of the radar. c) The noise figure of a radar receiver is 9 dB and if bandwidth is 2 MHz. find its minimum receivable signal.	10	CO3
Q 9	Differentiate the four different types of the resolutions with the schematic diagram and classify the signal signature properties in each one of them.	10	CO2

	SECTION-C		
Q 10	The Figure 1 below shows the Landsat-D mapping geometry. The background image is the earth surface. A Landsat track from north to south is shown on the earth surface. Scan width, swath width, spatial resolution, the altitude of the satellite are all shown in the Figure 1. Please answer the following questions: a. Based on the figure 1, what is the scanning configuration of the system b. What is the type of orbit of the satellite? c. How many pixels each scan line has? d. If the satellite moves at a speed of about 7 km/second, how many scans will be in each second? e. how much the scan frequency (Hz) will be? f. What is the dwell time? g. Calculate the dwell time of this system h. Do you think this system has good dwell time or bad dwell time? i. We know this landsat has seven bands, and radiometric resolution of the image is 8 bits, what is the data stream per second?  Figure 1	**20**	**CO1**
Q 11	The remote sensing scanning system as shown in Figure 2 with narrow and wider swath. What does it indicates? Explain the basic function of the satellite remote sensing and why the narrow and wider swath is required for the operation? List out the various Indian RS satellites. Brief out all IRS with their detailed specifications.	**20**	**CO4**

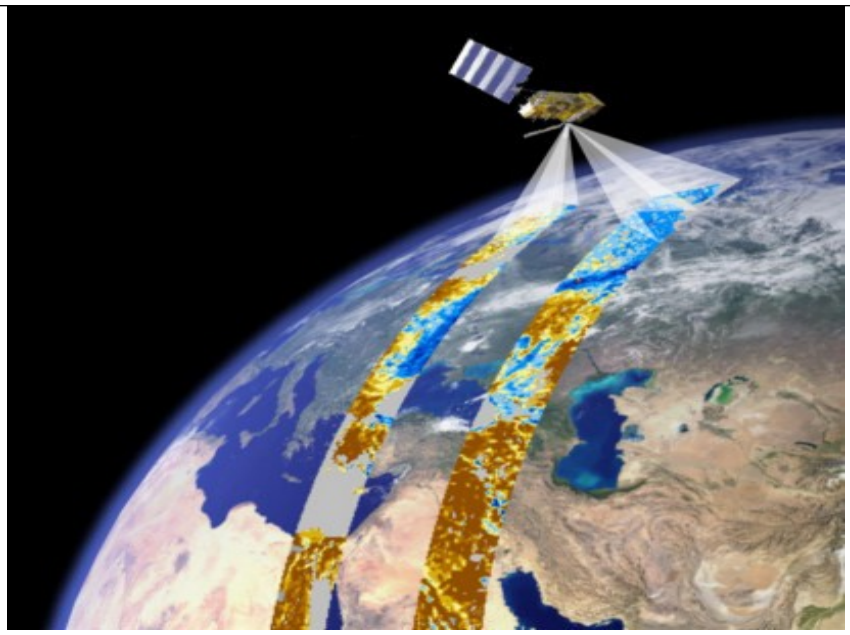


Figure 2

OR

Explain each parameter as shown in Figure 3. Also, define the role in active and passive remote sensing systems.

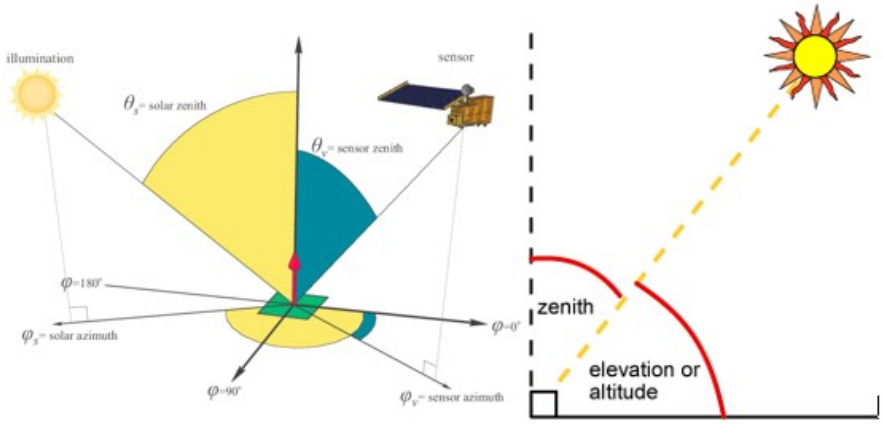


Figure 3