Department of Electrical Engineering
Final Assignment
Date: 24/06/2020

Course Details

Course Title: Radar and Satellite Communications   **Module:**   8th

Instructor: **Total Marks:**   50

Student Details

Name: **Student ID:**

Student Signature:

Q1		Answer the following questions: **a)** Is there any difference between Backscatter and Clutter, if yes then briefly discuss it? (02 Marks) **b)** A RADAR system may receive multiple forms of interference signals, so what can be those types of interfering signals discuss any three of them? (03 Marks) **c)** Discuss both Range resolution and Doppler resolution. How come they are important in target detection on the basis of their basic criteria? (03 Marks)	Marks 15 CLO 01

Q2.		Calculate the following antenna parameters:
		  a) the gain in dBi of a 3m parabolic reflector antenna at frequencies of 8 GHz and 14 GHz;
		  b) the effective area of an antenna with 46 dBi gain at 12 GHz. An efficiency factor of 0.55 can be assumed.
			Marks 10
			CLO 02

Q3.		Determine the range and free space path loss, uplink path loss and downlink path loss for the following satellite link: The service and feeder links between an Iridium satellite located at 760 km altitude and a ground location with a 70° elevation angle. The service link frequency is 1600MHz and the feeder link frequencies are 29.2 GHz uplink and 19.5 GHz downlink.	Marks 05 CLO 02
Q4.		A VSAT network operates with a satellite downlink consisting of a 3.2m satellite transmit antenna and a 1.2m ground receive antenna. The carrier frequency is 12.25 GHz, noise bandwidth of the downlink is 20 MHz, and the elevation angle for the ground station network ranges from 25–40°. Determine the minimum RF transmit power required for each terminal to maintain a minimum C/N_0 of 55 dBHz for any of the terminals in the network. The system noise temperature is 400 K. Assume an atmospheric path loss of 1.2 dB for the link. Line losses can be neglected. Antenna efficiency for the satellite antenna is 0.65 and for the ground antennas is 0.55.	Marks 10 CLO 02

Q5	Given below are the specifications of a RADAR system and a target which this RADAR will attempt to detect.	Marks 10 CLO03

RADAR specifications:	**Target Specifications:**
Transmit power 2MW Antenna gain 3000 Antenna effective aperture 15m2 Transmit frequency 1.27GHz Transmit pulse width 2.5μs Pulse repetition frequency 350pps Receiver noise factor is 3.	RCS is 10m2 Range from RADAR is 350nmi.

Determine the following.
Effective radiated power of RADAR. (02 Marks)
Forward power density of RADAR. (02 Marks)
Total power reflected. (02 Marks)
Power received/capture from target (04 Marks)