

Remote sensing S-92.3132. Spring term 2011.

## Remote sensing S-92.3132 examination 2.9.2011

9:00-12:00

No additional material is allowed.

### Compensation points from homework.

You have a possibility to leave out one exercise from this examination and use your homework points in the place of it. If the exercise for compensation is not indicated, the weakest is replaced by homework points automatically. Compensation points in respect of homework results: over 80% = 5p, 70% = 4p, 60% = 3p, 50% = 2p.

Laboratory work grade affects the final grade with the weight of 20%.

### Examination questions

1. (5p) Derive the radar equation for bistatic radar and explain all the steps.
  - a. What part of this equation describes the target?
  - b. How it is called?
  - c. What is the unit of this parameter?
  
2. (5p) Describe briefly
  - a. LIDAR
  - b. Synthetic aperture radar
  - c. Passive remote sensing instrument
  - d. Imaging spectrometer
  - e. Dicke radiometer
  
3. (5p) Write Planck's law. Explain. What is Raileigh-Jeans law? How they are connected? Why these laws are important in remote sensing? What type of instruments use directly Planck's law in their measurement interpretation?
  
4. (5p) A radiometer system has an antenna which is connected to a RF amplifier by a cable with attenuation 3 dB. The RF amplifier ( $F=3,5$  dB,  $G=20$  dB) is connected to mixer-amplifier ( $F = 5$  dB,  $G = 6$  dB) and IF amplifier ( $F = 7$  dB,  $G = 8$  dB) Temperature of the system is 280 K. Antenna temperature is 300 K. Calculate:
  - a. System noise figure and noise temperature
  - b. How the system could be improved
  - c. Draw a block diagram of the system
  
5. (5p) A polarimetric radar transmits in horizontal polarization and measures with the same polarization and gives for reading 1, when measuring the same signal with V antenna, reading is 1. When transmitting with vertical polarization, measurement reading is always 0 despite the receiving antenna polarization. What can you say about the target? Write scattering matrix of the target.