

Exam in TTM4105 Access and transport networks – Summer 2009 (English)

All tests count equally much.

Test 1 Optical systems

- a) Explain how we may pulse-modulate an optical signal using optical filter.
- b) Explain how an amplifier using erbium doped fiber is composed.
- c) Explain how an add-drop multiplexer is designed.

Problem 2 Land mobile systems

- a) Describe the architecture of a UMTS system that only offers IP (all-IP UMTS).
- b) Explain why the signal strength of the radio signal may vary considerably over short distances (fading).
- c) Explain how location updating is done in GSM.

Problem 3 Satellite systems

- a) Explain how a satellite can direct its antennas toward the Earth and keep them in this position.
- b) What is a link budget and what does it contain?
- c) Show how satellite connections can be used in the transport network. What is a geostationary satellite and why do we use just these types of satellites in the transport network?

Problem 4 Protocols

- a) Explain why protocols are layered. Which layers will a protocol commonly consist of (you may base your explanation on the protocol hierarchy of the internet)? Explain the reasons for your proposal.
- b) What is the reason for using ARQ (automatic repeat request) on some protocol layers?
- c) Explain what is meant by the statements that a protocol layer is *hard coded* or *soft coded*.