Högskolan i Halmstad
Sektionen för Informationsvetenskap, Data- Och Elektroteknik (IDÉ)
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Written Exam in
Modern Communication Systems and Networks

August 23, 2006.

Allowed aid in addition to the attached formulae:
Calculator and writing material.

Welcome to the exam!

READ THIS FIRST:

Motivate all answers. Insufficient motivations can give reduced points even if the answer is correct. Describe all calculations in detail. You will then have chance on points even if the calculations contain careless mistakes. If required, you are allowed to make own (reasonable) assumptions. You are allowed to answer in either ENGLISH or SWEDISH.

GOOD LUCK!

   Magnus

Number of exercises: 9
Maximal number of points: 60

The amount of bonus points from quizzes (in percentage) is multiplied by 0.6, rounded up to nearest "half point", and thereafter added to the exam points.

The grade limits are 30p to pass the exam (Grade 3), 42p for Grade 4, and 54p for Grade 5.

Formulae

Condition for a Clos network to be (strictly) non-blocking

$N2 \geq IN + OUT - 1$

The condition is necessary if $N1 \geq OUT$ and $N3 \geq IN$

Condition for a Clos network to be rearrangeably nonblocking

$N2 \geq \max(IN, OUT)$

Assignment 1 and 2: Select two (12+12p)

Choose **two** (and not more) of the following assignments. Appropriate length of an answer/description is 1-2 pages including figures. Write clear and concise. It's more important that what you write is coherent, logical and correct than everything in the subject being included. In other words, it's more important to show that you have an overall understanding than to just mention a lot of less important details. Please use examples when appropriate.

A. TCP

Give an overview of the flow control and congestion control mechanisms in TCP, including timer management too.

B. Internal architecture of switches and routers

Give an overview of the internal architecture of switches and routers. Examples of topics to be treated are: Clos networks, crossbar, scalability, strictly-non-blocking, queuing architectures (input, output, etc), HOL (Head of Line) effect, etc. Related topics like wormhole switching, Quality-of-Service (real-time) support etc are, however, not intended to be treated here.

C. WDM networking

Give an overview of WDM (Wavelength Division Multiplexing) network architectures including essential components.

Assignment 3: BGP (4 p)

Which reachable networks will BGP Router 3 announce to BGP Router 4 if AS 2 has a transit agreement with AS 1 and AS 3 has a transit agreement with AS 1?
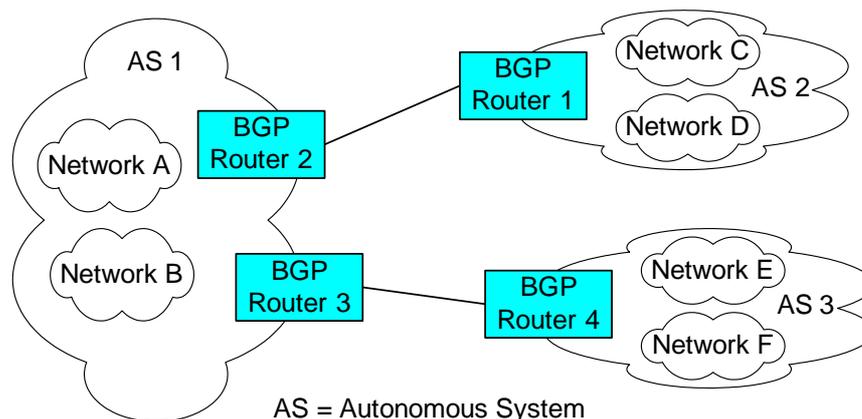

Assignment 4: CAN (6 p)

Explain how the MAC (Medium Access Control) method works for CAN (Controller Area Network) networks.

Assignment 5: Route aggregation (4 p)

Which network address, including network mask, will router A announce to other routers connected to network B when using route aggregation? The best route, not only considering full octets, must be chosen. The network mask must be given in binary form.
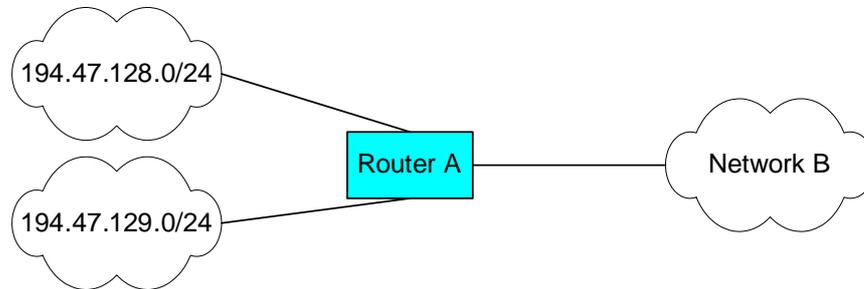
Assignment 6: RED (5 p)

Explain the aim and the function of Random Early Detection (RED).

Assignment 7: Mobile IP (8 p)

Assume that mobile Node A is in a foreign network and that Node B is in another network (neither Node A´s home network or the foreign network where Node A currently is). Explain all steps from the point in time that Node B initiates the transmission of a datagram to Node A, and until Node B have received a datagram from Node A (an application in Node A is assumed to answer Node B). You must use a figure and explain all steps so the role of all included parties is clear.

Assignment 8: WFQ (5 p)

Explain the function of Weighted Fair Queuing (WFQ), including simple mathematical description.

Assignment 9: VLAN (4 p)

A. Give an example of what information a layer 3-based VLAN can use to determine the VLAN membership (2 p)

B. Explain the difference in function between a switch with layer-3 based VLAN switching and an IP router (2 p)