student number

NB! Dette oppgavesettet (hvitt papir) skal studenten levere inn som eksamensbesvarelse

NTNU
The Norwegian University of
Science and Technology
Department of telematics

Side 1 av 14

Engelsk

Faglig kontakt under eksamen:

Navn: Leif Arne Rønningen
Tlf.: 92665
Det vil bli besøk på salene i perioden kl. 10 – 12.

EKSAMEN I EMNE SIE5003 KOMMUNIKASJON – TJENESTER OG NETT
EKSAMEN I EMNE SIE5003 TELEMATIKK – TJENESTER OG NETT

8. aug 2001
Kl: 0900 – 1300

Sensurdato: 29 aug 2001

Hjelpemidler:
A1 – kalkulator ikke tillatt
Ingen trykte eller håndskrevne hjelpemidler

☒

student number

0	☐	☐	☐	☐	☐	☐
1	☐	☐	☐	☐	☐	☐
2	☐	☐	☐	☐	☐	☐
3	☐	☐	☐	☐	☐	☐
4	☐	☐	☐	☐	☐	☐
5	☐	☐	☐	☐	☐	☐
6	☐	☐	☐	☐	☐	☐
7	☐	☐	☐	☐	☐	☐
8	☐	☐	☐	☐	☐	☐
9	☐	☐	☐	☐	☐	☐

Rules

This problem set (white paper) shall be delivered as your answer.
The yellow set shall be used for scratching, and you shall take it with you after the examination (it will not be evaluated).

The following rules are valid for the white problem set:

The student number shall be written on all pages ***with digits.*** In addition, on this page (2) ***each digit shall be checked in the boxes below the digits*** for control (one mark per column).

The sheets will be read optically. Follow the rules below to avoid wrong interpretations.

Use blue or black ball-pen, not a pencil.

Check the boxes as clear as you can, like this: ☒

If you need to correct, ask for a new sheet.
You are not allowed to use rubber or other correcting means, for example scratching.

Do not write outside the box fields or the student number fields.

A sub-problem may include one or more box fields. Each field will be evaluated individually, and may have different checking rules. A field shall in some cases be checked with only one mark, and in other cases with none, two or more marks. See the text of each problem. The lowest score for each field is 0 points. If the problem asks for only one check per field, you obtain 0 points if two or more boxes are checked. If the problem asks for two or more marks per field the following rules apply: Each correct mark gives 1.0 point. Missing marks give 0 points. *One* incorrect mark per field is ignored. One additional incorrect mark per field give 0.5 points discount, two additional incorrect marks give 1.5 points discount, and so on progressively. If you are unsure, it could be advantages *not to check*, rather than to check randomly.

student number

1: THE PHYSICAL LAYER (25%)

1.1 GENERAL MULTIPLE CHOICE

a) Check the ‘agree’ OR the ‘disagree’ box for each question:

agree	disagree	
☐	☐	A twisted pair cable of 100 meters can be used for data rates at 1 to 2 Gbps.
☐	☐	Frequency domain signals can be represented in the time domain by Fourier Series.
☐	☐	Shannon’s theorem on data rates takes noise into account.
☐	☐	ATM is circuit switched.
☐	☐	GSM is an analog cellular system
☐	☐	With packet switching, there is no limit on block size, witch means that routers must have disks to buffer long blocks.
☐	☐	A virtual circuit is connectionless
☐	☐	Narrowband ISDN is based on ATM technology.
☐	☐	A virtual circuit is connectionless
☐	☐	For 1-km coaxial cable a data rate of 1 to 2 Gbps is feasible.

b) GSM uses: (check one box)

☐ FDM (frequency division multiplexing) only
☐ TDM (time division multiplexing) only
☐ Both FDM and TDM
☐ WDM (wavelength division multiplexing) only
☐ Both WDM and TDM

c) Narrowband ISDN uses: (check one box)

☐ Circuit switching only
☐ Packet switching only
☐ Message switching only
☐ Cell switching only
☐ Circuit switching and packet switching

student number

d) WDM (Wavelength Division Multiplexing) is a variation of: (check one box)

- ☐ TDM
- ☐ GSM
- ☐ UMTS
- ☐ FDM
- ☐ None of above

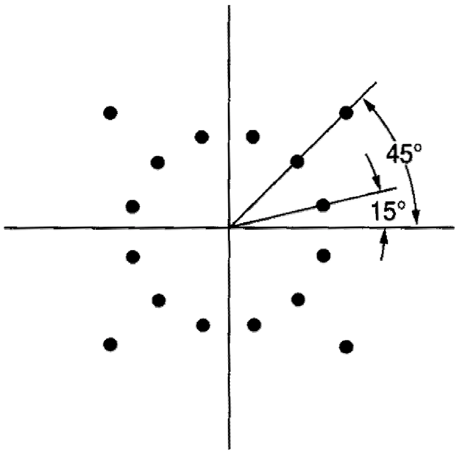
e) Error control in the link layer is not needed when the physical layer consist of: (check one box)

- ☐ Twisted pair cable
- ☐ Fiber cable
- ☐ Radio transmission
- ☐ Infrared
- ☐ Coaxial cable

1.2 CODING

Coding. *The amplitude-phase diagram (polar coordinates) below shows how amplitude shift keying (ASK) and phase shift keying (PSK) can be used simultaneously. How many bits can be coded on each physical symbol in this case? (check one box)*

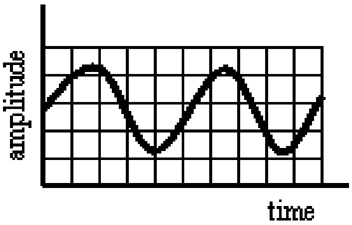
- ☐ 8 bit
- ☐ 3 bit
- ☐ 4 bit
- ☐ 16 bit
- ☐ 1 bit



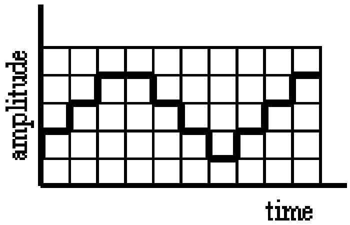
student number

1.3 SIGNALS

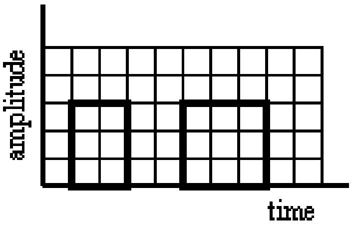
Below six different signals are shown. Discrete points can only lie on the grid, all other points represent continuous values.
(check one box for each signal)



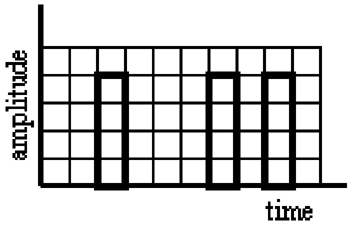
- ☐ analog
- ☐ digital
- ☐ other



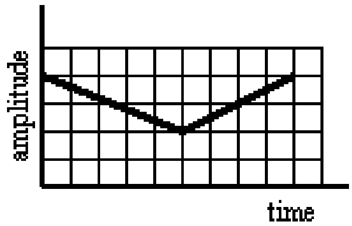
- ☐ analog
- ☐ digital
- ☐ other



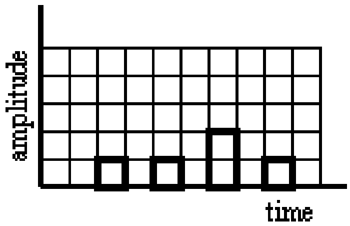
- ☐ analog
- ☐ digital
- ☐ other



- ☐ analog
- ☐ digital
- ☐ other



- ☐ analog
- ☐ digital
- ☐ other



- ☐ analog
- ☐ digital
- ☐ other

student number

2: MEDIUM ACCESS LAYER (25%)

2.1 GENERAL MULTIPLE CHOICE

a) Check the 'agree' OR the 'disagree' box for each question:

agree	disagree	
☐	☐	UMTS uses broadcast channels
☐	☐	GSM uses the slotted ALOHA principle
☐	☐	MAC (Medium Access Control) uses point-to-point connections
☐	☐	Large Ethernets may use repeaters
☐	☐	Token ring networks have monitor stantions that oversees the ring
☐	☐	Bridges cannot be used between different 802.x networks
☐	☐	Ethernet uses twisted pair cabling only
☐	☐	Backward learning is typical to transparent bridges
☐	☐	FDDI uses LED due to cost and compatibility with user workstations
☐	☐	Dynamic FDM channel allocation is efficient when the number of stations is small

b) What is true about ALOHA? Check the 'agree' OR the 'disagree' box for each question:

agree	disagree	
☐	☐	ALOHA is a contention system
☐	☐	In slotted ALOHA a computer may start sending at fixed points in time
☐	☐	In ALOHA the risk of collision is accepted
☐	☐	ALOHA checksum help distinguish between a total loss and a near miss
☐	☐	Pure ALOHA has better channel utilisation than slotted ALOHA

student number

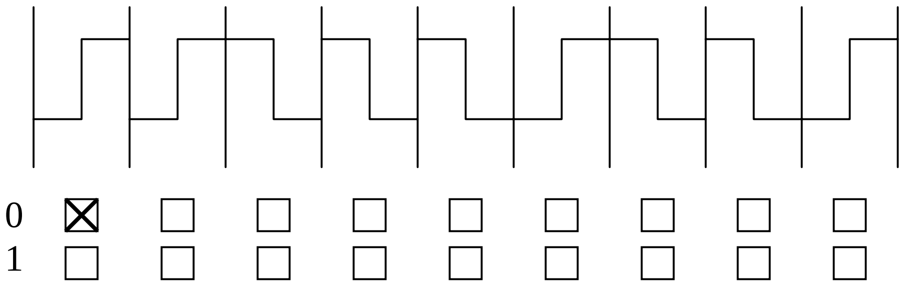
c) What is true about CSMA? Check the 'agree' OR the 'disagree' box for each question:

agree	disagree	
☐	☐	Due to propagation delays 1-persistent CSMA may lead to collisions
☐	☐	Compared with 1-persistent CSMA, nonpersistent CSMA has longer delays
☐	☐	Compared with 1-persistent CSMA, nonpersistent CSMA has better channel utilisation
☐	☐	P-persistent CSMA allways waits until next slot with probability (1 – p)
☐	☐	Using CSMA; the best channel utilization is 1/e

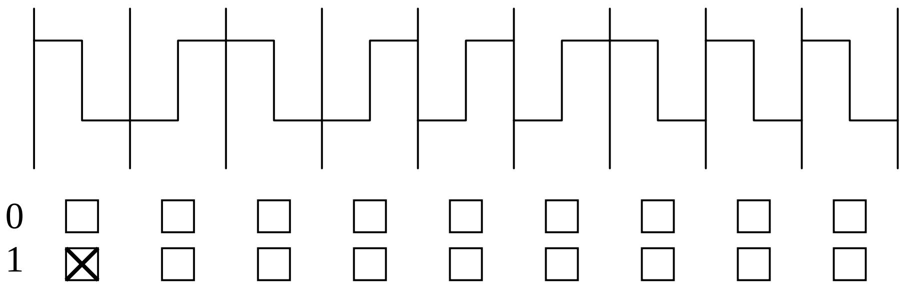
2.2 ENCODING

This task has three subtasks. Each subtask starts with a sequence that you shall decode. Express your interpretation through the check boxes below each sequence figure: Check only one box (0 or 1) for each column.

a) *Signal encoded with Manchester encoding*

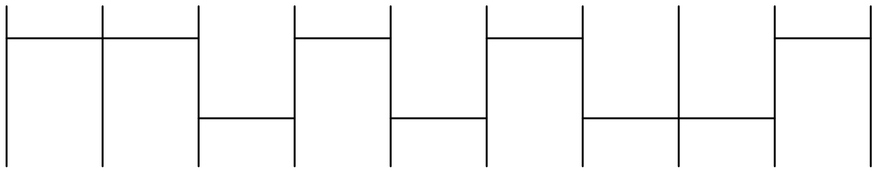


b) *Signal encoded with differential Manchester encoding*



student number

c) *Signal encoded with binary encoding*



0 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
1 ☒ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

2.3 CDMA

a) The chip sequence {+1,-1,+1,+1} and {-1,-1,+1,-1} are sent synchronously from two sources onto a medium and are added. The chip elements are represented by either +1 or –1 volt. Which voltages can be measured in the medium? (check one box)

☐ {+0,-2,+2,+0}
☐ {+0,-1,+3,-2}
☐ {-2,-2,+0,+2}
☐ {+2,+2,+1,+2}
☐ {-2,+2,+0,-2}

b) A receiver listens (measures) on the medium described in problem 4.3 b), and wants to receive from the source sending the chip-sequence {-1,-1,+1,-1}. The receiver finds the right source by calculating the inner product, denoted {}{} below (check one box).*

☐ {+1,-1,+1,+4}*{-2,+2,+0,-1}
☐ {-2,+2,+0,-2}*{+1,-1,+1,+1}
☐ {-1,-1,+3,-2}*{-1,-1,+1,-1}
☐ {-2,+2,+0,-2}*{-2,+2,+0,-2}
☐ {+0,-2,+2,+0}*{-1,-1,+1,-1}

student number

3: THE NETWORK LAYER (12.5%)

a) Check the 'agree' OR the 'disagree' box for each question:

agree	disagree	
☐	☐	A connectionless service has no flow control in the network layer.
☐	☐	ATM never uses virtual circuits.
☐	☐	It is possible to run IP over ATM.
☐	☐	Adaptive routing: routing decision is usually changed according to traffic variations
☐	☐	IPv6 only supports unicast addresses.
☐	☐	Datagrams always follow the same route.
☐	☐	Repeaters queue incoming packets
☐	☐	Gateways are only used on the network layer.
☐	☐	Fragmentation means that packets are divided into smaller pieces.
☐	☐	A firewall intends to protect a computer against unwanted hacking.

b) IPv4 (check one box)

☐ Doesn't support multicast
☐ Supports 48 bits IP addresses.
☐ Uses datagrams.
☐ Is connection oriented.
☐ Uses packets of typically 64Kbytes length.

c) IPv6 (check one box)

☐ IPv6 has better multimedia support than IPv4.
☐ IPv6 has a checksum field in the header.
☐ IPv6 uses addresses with format xxx.xxx.xxx.xxx (xxx = 0-255)
☐ IPv6 is significantly slower than IPv4.
☐ IPv6 has ten times the address space of IPv4

student number

d) *Fragmentation (check one box)*

- ☐ An IPv4 packet can at most have 16 fragments
- ☐ IPv6 supports fragmentation.
- ☐ In IPv4 all fragments must be a multiple of 8.
- ☐ A fragmented packet cannot be reconstructed.
- ☐ Fragments do not need numbering.

student number

4: TRANSPORT LAYER (12.5%)

a) Check the 'agree' OR the 'disagree' box for each question:

agree	disagree	
☐	☐	One of the transport layer's functions is to handle QoS.
☐	☐	Using gigabit networks: the round trip delay is negligible due to high speed.
☐	☐	Isochronous transfer: transfer without any time requirements to the information units.
☐	☐	The transport layer requires that the network layer is connectionless.
☐	☐	The NSAP address uniquely identifies an application
☐	☐	In a fast network small packets give faster transfer.
☐	☐	The window mechanism implements adaptive routing.
☐	☐	The stop-and-wait protocol without sequence numbering may cause duplicated PDUs in the network.
☐	☐	Three-way handshaking is applied to increase protocol robustness
☐	☐	Selective repeat is efficient when the bit error rate is high.

b) ATM AAL (check all that apply)

☐ (AAL) 5 is functionally similar to UDP.
☐ Provides 100% reliable end-to-end connections.
☐ Supports both real-time and non-real-time transfer
☐ Uses the IP addressing scheme
☐ Can be either connectionless or connection oriented

c) UDP (check all that apply)

☐ Is connectionless.
☐ Is an application layer protocol.
☐ Guaranties QoS.
☐ Is used in many applications with one request and one response.
☐ Provides flow control.

student number

d) TCP (check all that apply)

- ☐ Connection is uniquely identified by [A-socket address, B-socket address]
- ☐ Supports Urgent Data
- ☐ Uses 3-way handshaking for connection establishment.
- ☐ Uses full duplex connections.
- ☐ Uses slow start to prevent congestion.

student number

5 **APPLICATION LAYER** (25%)

a) Check the 'agree' OR the 'disagree' box for each question:

agree	disagree	
☐	☐	ALOHA is an application layer protocol
☐	☐	HTTP 1.1 can be used with Secure Socket Layer (SSL)
☐	☐	Web browsers *normally* act as clients
☐	☐	Mpeg is a MIME subtype
☐	☐	POP3 does not move messages to the user's personal machine
☐	☐	SMTP uses UDP
☐	☐	SMTP is an ASCII based protocol
☐	☐	A Media Player does not provide video decompression
☐	☐	Blind carbon copy (Bcc)-recipients are exposed to all recipients
☐	☐	Using a Key Distribution Center guarantees secure authentication

*b) Check all allowed **email**-addresses:*

☐ post@item.no
☐ ntnu.fim.no
☐ no.ntnu.fim
☐ fim.ntnu.no
☐ emil@it.cjb.edu.jp
☐ emil@ntnu
☐ www.net
☐ emil@ilb.com
☐ ntnu/no.com
☐ no.com/ntnu

d) Check all allowed DNS name of hosts:

☐ post@item.no
☐ ntnu.fim.no
☐ no.ntnu.fim
☐ fim.ntnu.no
☐ emil@it.cjb.edu.jp
☐ emil@ntnu
☐ www.net
☐ emil@ilb.com
☐ ntnu/no.com
☐ no.com/ntnu

student number

e) Check all boxes that apply to DNS:

- ☐ Nonoverlapping name space zones
- ☐ Resolvers which look up remote names
- ☐ Developed for ARPANET
- ☐ Uses both UDP and TCP
- ☐ ISO defined country codes
- ☐ Case sensitive

f) Check all boxes that apply to PGP:

- ☐ Uses DES
- ☐ Uses IDEA
- ☐ Uses RSA
- ☐ Uses Message Digests
- ☐ PGP means Privacy Guarded Post
- ☐ PGP means Privacy Guaranteed Protocol
- ☐ PGP means Pretty Good Privacy
- ☐ PGP means Personal Guaranteed Post

e) MIME means (check one box only):

- ☐ Multi InterMedia Enhancement
- ☐ Multimedia Internet Encoding
- ☐ Multipurpose Internet Mail Extensions
- ☐ Multicoded InterMail Enhancement
- ☐ Multi-Integrated Media Extensions