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 12

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 2002
Kl: 0900 – 1300

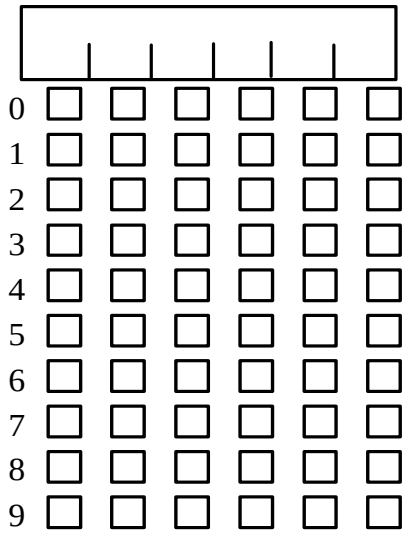
Sensurdato: 2.sep 2002

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

☒

2

student number



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 box 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. If you are asked for only one mark per field, you obtain 0 points if two or more boxes are checked. If you are asked for one, two or more marks per field the following rules apply: Each correct mark gives 1.0 points. 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. The actual score of the box field is calculated, relative to the maximum obtainable score of the field. The lowest actual score for each field is 0 points.
The 30 boxes of an ‘agree-disagree’ problem constitute one box field.

student number

3

1 THE PHYSICAL LAYER (25%)

1.1 Signals, transmission

Check the 'agree' OR the 'disagree' box for each statement:

agree	disagree	
☐	☐	A binary signal with period T can never be represented by a Fourier series
☐	☐	If a signal using V discrete levels is sent through a channel of bandwidth H, the maximum data rate is according to Nyquist's theorem equal to $4H \log_2 V$ bits/sec
☐	☐	Given a channel with limited bandwidth and Gaussian noise. According to Shannon's theorem the maximum data rate decreases with increasing noise when the signal strength is constant
☐	☐	Coaxial cables have got a high noise immunity compared to unshielded twisted pair cables
☐	☐	Twisted pair cables can only be used for digital transmission
☐	☐	Existing optical fiber transmission systems support data rates above 1 Gbits/sec.
☐	☐	Light emitting diodes can never be used as light sources for optical fiber cables
☐	☐	An advantage of wireless systems is that they can support mobility
☐	☐	A GSM mobile phone can transmit signals that may disturb other electronic equipment
☐	☐	Multipath fading is independent of frequency
☐	☐	The baud rate of a signal is always equal to the bit rate
☐	☐	An electromagnetic wave in empty space with wavelength of 1 cm, has a frequency of 30 GHz (when the speed of light is 3×10^8 meter/sec)
☐	☐	A signal coming out of a low-pass filter of bandwidth H can be completely reconstructed by making 2H samples per second
☐	☐	A signal has a varying positive but unknown amplitude between time points 1 and 2 seconds, and elsewhere the amplitude = 0. The signal contains frequency components above 1 GHz. The signal cannot be completely reconstructed after it has been run through a channel of bandwidth 1 GHz
☐	☐	A passive star connection in an optical fiber network can be used for broadcasting of optical signals

student number

4

1.2 The telephone net, modulation, multiplexing

Check the 'agree' OR the 'disagree' box for each statement:

agree	disagree	
☐	☐	Fully interconnected net structures are cost ineffective when the number of telephones is large
☐	☐	Hierarchical net structures can be cost effective when many service subscribers are distributed over large areas
☐	☐	A modem can be a device that converts a serial stream of bits into a modulated carrier
☐	☐	A modem can be a device that converts a modulated carrier into a serial stream of bits
☐	☐	The local loop (twisted pair cable) suffers from at least three major problems: attenuation, delay distortion, and noise.
☐	☐	A sine wave can be modulated by changing it's frequency
☐	☐	A sine wave can be modulated by changing it's frequency and amplitude simultaneously
☐	☐	A sine wave is modulated such that four phases and two amplitude levels per phase are allowed. This scheme can be used to transmit 4 bits per baud.
☐	☐	Balanced transmission gives lower cross talk noise than unbalanced
☐	☐	'Fiber to the home'-FTTH, is normally less expensive than twisted pair cable local loop
☐	☐	'Fiber to the curb'-FTTC means that there are fibers between each subscriber and a junction box, and there is a high-capacity radio link between the junction box and the nearest switching office
☐	☐	TDM – Time Division Multiplexing: a user uses the maximum transmission capacity, but only part of the time
☐	☐	FDM – Frequency Division Multiplexing means that each user uses the whole available bandwidth and part of the timeslots in a cyclic manner
☐	☐	Wavelength Division Multiplexing is mostly used on coaxial cables
☐	☐	Delta modulation: a single bit is transmitted, telling whether the new sample is above or below the previous one

student number

5

1.3 Switching, ISDN, ATM, wireless systems

Check the 'agree' OR the 'disagree' box for each statement:

agree	disagree	
☐	☐	Circuit switching: an end-to-end physical channel of fixed capacity is established before data transfer, kept during data transfer, and released when the data transfer is finished
☐	☐	Packet switching uses the store-and-forward principle
☐	☐	With circuit switching the utilization of the channel is always low
☐	☐	Packet switching always utilises the channel 100%
☐	☐	When most of the packets in a channel carry 3-4 bytes of useful information in addition to the packet header, packet switching is inefficient
☐	☐	The mostly used ISDN channel combination is 5B + 2D
☐	☐	Broadband ISDN uses packet switching
☐	☐	To set up a virtual circuit means to choose a fixed route from source to destination
☐	☐	When a virtual circuit is established, in some cases channel capacity can be reserved
☐	☐	ATM uses cell switching, which is based on packet switching
☐	☐	The cell time delay through an ATM network is constant
☐	☐	One good reason to have geo-synchronous satellites is that the earth receiver antenna can be in a fixed position
☐	☐	The end-to-end transit delay for a geo-synchronous satellite is less than 10 milliseconds
☐	☐	For a given receiver signal strength and a given coverage area, e.g. Scandinavia, a low-orbit satellite normally needs less transmitting power than a geo-synchronous satellite
☐	☐	An important property of satellites used for broadcasting is that the transmit and transport resource usage is independent of the number of receivers within a fixed coverage area

student number

6

2 LOCAL AREA NETWORKS - LAN (25%)

2.1 Ethernet and the IEEE Standard 802.3

Check the 'agree' OR the 'disagree' box for each statement:

agree	disagree	
☐	☐	The Ethernet is a 1-persistant CSMA/CD LAN
☐	☐	The notation 10Base5 means that the Ethernet LAN can support segments up to 10 meters, and operates at 5 Mbps
☐	☐	802.3 does not specify use of fiber optics
☐	☐	1 0 0 0 0 1 0 1 1 bit stream HL LH LH LH LH HL LH HL HL Manchester Encoding, H-high, L-low
☐	☐	1 0 0 0 0 1 0 1 1 bit stream HL LH HL LH HL HL LH L HL Differential Manchester Encoding, H-high, L-low
☐	☐	The Preamble of the 802.3 frame produces a square wave used to synchronise the receiver clock to the sender clock
☐	☐	A destination address field of 2 bytes can address more than 2^{16} receivers
☐	☐	The Checksum of the 802.3 frame uses a cyclic redundancy check algorithm
☐	☐	After 3 collisions on Ethernet a random number between 2 and 6 is chosen, and that number of slots is skipped before new trial
☐	☐	After 4 collisions on Ethernet a random number between 0 and 15 is chosen, and that number of slots is skipped before new trial
☐	☐	The Checksum of the 802.3 frame can be used to check if the bits of the frame were garbled by noise
☐	☐	A parameter Ack of the 802.3 frame is used for acknowledgement
☐	☐	The CS letters of CSMA/CD denotes 'Carrier Sense'
☐	☐	1-persistent means that the station transmits with probability of 1 when the channel is idle
☐	☐	To detect all collisions on an Ethernet cable, the frame must take less than 2t to send, when t is the propagation time from one end to the other of the cable

student number

7

2.2 Token ring, the IEEE Standard 802.5

Check the 'agree' OR the 'disagree' box for each statement:

agree	Disagree	
☐	☐	Token ring uses a special bit pattern, called the token, that circulates around whenever all stations are idle
☐	☐	Three operating modes are specified for ring interfaces: transmit, listen and ready-to-transmit
☐	☐	The token ring is a collection of point-to-point links that form a circle
☐	☐	The transmitting station must drain the ring while it continues to transmit a frame
☐	☐	A Wire Center is normally introduced to increase the traffic capacity of a ring
☐	☐	A station in the listen mode does not delay the bit stream on the ring
☐	☐	When a station has seized the token, it can transmit continuously only for a preset time period
☐	☐	The frame length of the 802.5 frame is limited to 1500 bytes
☐	☐	The Frame control field of the 802.5 frame distinguishes data frames from control frames
☐	☐	The Starting delimiter field of the frame uses a valid Differential Manchester code pattern
☐	☐	The 802.5 standard does not support acknowledgement of frames
☐	☐	If a station wants to send a frame with priority n it must wait until it can seize a token with priority higher than n
☐	☐	If a non- Differential Manchester pattern is found where it is not permitted, this can be reported in the End delimiter field of the frame by setting a bit.
☐	☐	A Monitor station's main task is to prevent traffic overload on the ring
☐	☐	On the ring, all stations can be elected as Monitor station

student number

8

2.3 Bridges, LLC-Logical Link Control

Check the 'agree' OR the 'disagree' box for each statement:

agree	Disagree	
☐	☐	Bridges can be used to interconnect LANs
☐	☐	Ethernets and Token ring nets can be interconnected by bridges
☐	☐	Bridges operating on the LLC layer changes IP addresses
☐	☐	The frame formats for Ethernet, Token bus and Token ring are equal
☐	☐	Frames of lengths 5000 bytes from a Token ring net are always fragmented before they are sent into an Ethernet
☐	☐	A bridge interconnecting two Ethernets may drop frames if the destination Ethernet is overloaded
☐	☐	When a 100 Mbps Ethernet is connected to a 10 Mbps Ethernet via a bridge, the bridge should have buffering capabilities
☐	☐	Promiscuous mode means a mode where only frames addressed to a PC are received by that PC
☐	☐	A hash table tells on which LAN to put a frame with a given destination
☐	☐	A hash table of a bridge contains only destination addresses on LANs that are directly connected to the bridge
☐	☐	When a hash table is empty, a flooding algorithm is used to learn to which LANs destinations are connected
☐	☐	All entries more than a few minutes old in a hash table will automatically be deleted
☐	☐	A Transparent bridge reacts to an incoming frame as follows: If destination and source LANs are the same, forward the frame
☐	☐	A Transparent bridge reacts to an incoming frame as follows: If the destination and source LANs are different, discard the frame
☐	☐	A Transparent bridge reacts to an incoming frame as follows: If the destination LAN is unknown, use flooding

student number

9

3 PROTOCOLS (25%)

3.1 Describe the IP protocol (within the frame below)

3.2 Describe the TCP protocol (within the frame below)

student number

10

3.3 Describe the RTSP protocol (within the frame below)

student number

11

4 APPLICATIONS (25%)

4.1 Describe the DNS system (within the frame below)

4.2 Describe electronic mail (within the frame below)

student number

12

4.3 Describe the WWW, World Wide Web (within the frame below)