PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination: Semester 2   **Academic Year:** 2012-2013

Date: February 22, 2013 (2556)   **Time:** 09:00 – 13:00

Subject Number: 242-642   **Room:** A401

Subject Title: Multicast Protocol & Applications

Name: _____   Student Number: _____

Exam Duration: 3 hours

This paper has 12 pages (including this page).
- Write the answers in the spaces provided in the examination paper.
- Clearly write your student number in the space provided at the top of each page. Write your name and student number in the spaces provided on this cover page.
- There are 120 marks total for this exam.

Authorised Materials:
- Anything the student can carry (except communication devices.)

Instructions to Students:
- Attempt all 10 questions .
- Anything illegible is incorrect.
- Answer briefly where possible, essays are **not** required. There is no need to use all of the space provided for each answer!
- The marks allocated for each question are shown next to that question.
- *Answer questions in English.* Good English is **not** required.

For marker's use only.

1	2	3	4	5	Sub-Total

6	7	8	9	10	Sub-Total

Total

Question 1.   *(25 marks)*

Give the sequence of events that might occur if an organisation decides to make available some audio and video event as a multicast transmission over the Internet.

You can assume that a multicast capable IP network exists, and is correctly operating, and reaches the entire intended audience of the event.

Explain what needs to be done to establish the multicast session, and how each of the necessary steps may be accomplished.

Include all major steps from the initial decision to broadcast the event using multicast over the Internet, until the event has concluded.

In the explanations, you need mention only one recipient, it can be assumed that any others perform similar acts in similar ways.

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Question 2.   *(15 marks)*

A)   Scalable Reliable Multicast (SRM) uses random delays as part of the operation of the protocol. Explain the purpose of those delays, and what benefits they bring to the operation of the protocol.

What are the costs of this approach?

[10 marks]

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B)   Two nodes (**A** and **B**) are both delaying before sending a Negative Acknowledge (NAK) for the same missing packet, one (**A**) selecting a random delay in the interval [0..2] seconds, and the other (**B**) in the interval [0..5] seconds.

From this information, what, if anything, might you be able to conclude about the relationship between **A**, **B** and **S** (the sender of the multicast packets) ?

[5 marks]

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Question 3.   *(5 marks)*

Unicast networking for IP uses a protocol (The Address Resolution Protocol, ARP, for IPv4, and Neighbor Discovery, ND, for IPv6) to obtain the link layer address to use when transmitting a datagram (packet) to a particular destination.

For multicast packets, this is not done, instead an algorithmic translation of the destination address into the link layer address is performed.

Why was this designed differently for multicast?

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Question 4.   *(15 marks)*

The multicast routing protocol **PIM** (Protocol Independent Multicast) has two modes.

A)   What are they?

[2 marks]

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B)   When is each appropriate?

[5 marks]

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C)   What are the differences between the two modes?

[8 marks]

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Question 5.   *(15 marks)*

A)   Explain why the existence of a standard multicast address allocation method is desirable, and what the consequences would be without one.

[6 marks]

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B)   Why is this a difficult problem in general?

[2 marks]

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C)   How does the introduction of Source Specific Multicast (SSM) alter the address allocation problem (where it is used)?

[2 marks]

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D)   Explain the suggested IPv6 multicast address allocation mechanism, for Any Source Multicast (ASM) addresses. Include in your answer an explanation why it is simple, and reliable.

Consider the issues created by a large network (the whole Internet) when answering this question, and contrast IPv6 with IPv4 address allocation mechanisms for the same problem area.

[5 marks]

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Question 6.   *(10 marks)*

A)   Explain the role of a Rendezvous Point (RP) used with the PIM
(Protocol Independent Multicast) Sparse Mode (PIM-SM) routing
protocol.

[6 marks]

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B)   What is the major disadvantage of the use of a Rendezvous Point and
how does PIM-SM allow this to be alleviated (that is: made into less
of a problem.)

[4 marks]

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Question 7.   *(8 marks)*

Multicast sessions are often advertised using the Session Description Protocol (SDP).

SDP data is most commonly carried as the payload of Session Advertisement Protocol (SAP) packets.

Give an example (or examples) of other ways of distributing SDP data, explain how that way works, (or those ways work,) and give any advantages or disadvantages of using an alternative to SAP.

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Question 8.   *(10 marks)*

Some protocols use multicast to avoid needing to send packets to multiple recipients many times, or otherwise arrange redistribution points. These protocols often work without difficulty using unicast if only two parties are involved.

Other protocols fail to function usefully if multicast is not available, regardless of how many nodes participate.

Give examples of this second class of protocols, and explain why multicast is essential for them.

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Question 9.   *(10 marks)*

Multicast OSPF and (normal unicast) OSPF both use the identical Shortest Path First algorithm to calculate paths to the destination(s).

Yet, there is one essential difference between the way the protocol is used for the two protocols – a router would not be calculating the same path to a destination network, and to a multicast group member that is resident on that network.

Explain what the difference is, and why it is required that this difference exists.

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Question 10.   *(7 marks)*

    A)   Explain the purpose of the Real Time Control Protocol (RTCP) when used in conjunction with the Real Time Protocol (RTP).

            Include in your answer an indication what information is available to RTCP participants in a multicast session that would not be available without it.

[4 marks]

    B)   There are three main RTCP packet types (Receiver Reports, Sender Reports, and Source Description.) Indicate which types of nodes send, and which types of nodes receive, each of those packet types.

[3 marks]