UNIVERSITY OF BOLTON

SCHOOL OF CREATIVE TECHNOLOGIES

COMPUTER NETWORKS AND SECURITY

SEMESTER 1 EXAMINATIONS 2023/2024

NETWORK MANAGEMENT

MODULE NO: SEC6206

Date: Tuesday 9th January 2024   Time: 2:00 – 4:00

INSTRUCTIONS TO CANDIDATES: There are SIX questions on this paper.

Answer ANY FOUR questions.

All questions carry equal marks.

This is "open book" examination, and you may use a limited number of notes to aid your discussions. These must be printed and no more than 4 sides of A4 paper.

You may use a calculator to aid you in answering appropriate questions.

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Question 1

1a)   Cobs Coaches network management team have seen a recent surge in IT support calls, particularly regarding delays in accessing client data, especially during peak sales transactions. They operated a heterogeneous network comprising of Juniper switches, VYOS routers, and Windows servers managed exclusively through the Command Line Interface (CLI).

Outline your strategy to identify and measure the root cause of the slow response. Your approach should distinguish whether the issue lies within the Network Entities or the servers.

[15 marks]

1b)   In the Cob Coaches network they have several managed switches each with SNMPv2 enabled. Provide an explanation of the process for remotely retrieving information such as performance data from the device using SNMP commands through the command line prompt. Additionally, specify the command you would use if your objective was to navigate through a set of Object Identifiers (OIDs). Assume that the device is using SNMPv2 and the IP address of the management interface is 192.168.246.202

[10 Marks]

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Question 2

2a) A 4000-byte packet is sent from Network A to Network C, traversing through Network B. The MTU (Maximum Transmission Unit) for Network A is 4464, Network B is 518, and Network C is 1500. Explain the potential impact of the varying MTUs on the fragmentation of the 4000-byte packet as it travels through these networks.

[15 marks]

2b) In the context of network management, explain the significance of fragmentation. Provide at least three reasons why fragmentation is important in the efficient management of networks. Additionally, discuss the potential challenges that may arise in a network that does not handle fragmentation appropriately.

[10 marks]

Question 3

3a) With the aid of a diagram evaluate the architecture of a typical flow monitoring solution used in data networks.

[13 marks]

3b) Contrast the differences between Netflow/IPFIX, SNMP and sFLOW and provide a use case for each of the network management protocols.

[12 marks]

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Question 4

4a) Give a critical analysis of the various elements of an SNMP protocol stack. In particular include layers involved at both the ends and across the network. Your description of the end system should include the interaction of SMI, ASN.1 and BER. You may use diagrams to help with your discussion.

[15 Marks]

4b) The Management Information Base (MIB) is one of the fundamental elements of Network Management systems. Give an descriptive account of the MIB structure, it's role and details about interface and RMON areas.

[5 Marks]

4c) In a multi-vendor environment that contains various versions of SNMP and non-SNMP devices, show how these problems can be overcome and accommodated with an SNMP Management system.

[5 Marks]

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Question 5

5a) For the most part network traffic across the Internet is *bursty* meaning that congestion is a natural element of networking. Figure A and Figure B show the congestion window for two different algorithms to deal with congestion. Identify the congestion algorithms and critically contrast the differences between them.
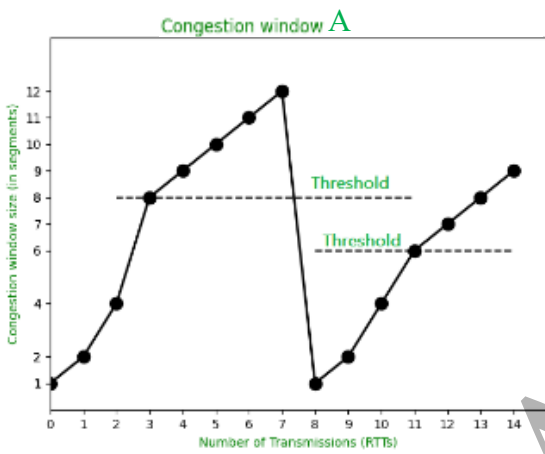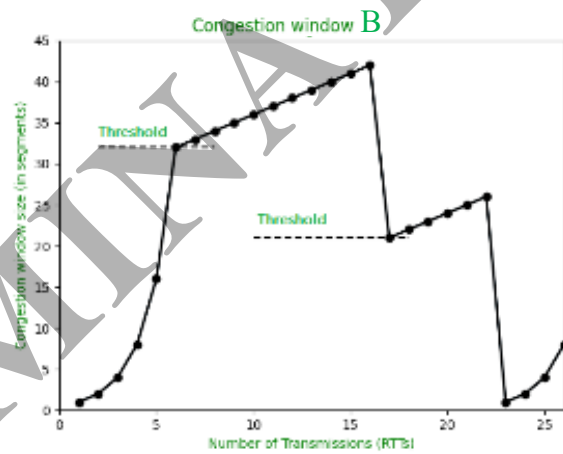

Figure a

Figure b

[10 Marks]

5b) Discuss the necessity of incorporating multiple congestion control policies within TCP congestion algorithms. Provide a critical comparison of at least two congestion policies, supported by graphs and packet flow diagrams to enhance your analysis.

[15 Marks]

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Question 6

6a)   What is SNMP, MIB, Inform, trap and set request? Evaluate the Components and states ports are used in SNMP? Support your answer with examples.

[10 marks]

6b)   Discuss the concept of Bandwidth-Delay Product in the context of the provided network topology. Include a calculated example illustrating the number of packets that D will have transmitted before B begins receiving the initial packet sent by D. Assume that D is transmitting data in 500-byte packets.
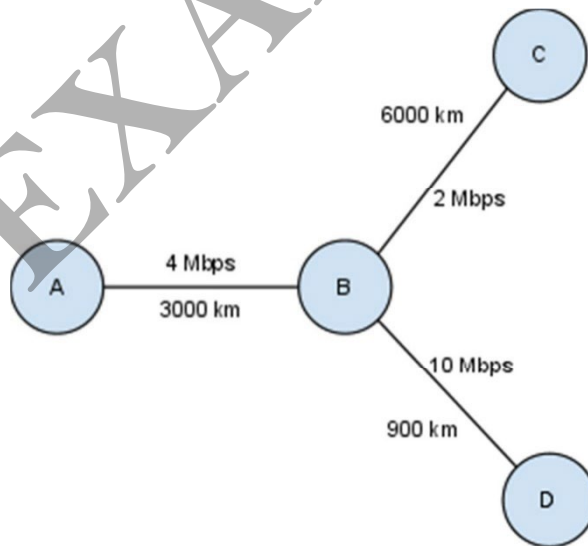
Assume that data travels through the links at 2.4e8 m/s.

Figure c Network Topology. Assume that data travels through the links at 2.4e8 m/s

[15 Marks]

END OF QUESTIONS
END OF PAPER