



Complete the information below about yourself very carefully.

QM student number

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BUPT student number

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Class number

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Complete the information below about the exam you are taking very carefully.

Module code number

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Module title

Make and type of any electronic calculator you are using

Write down the question number of the questions you have answered in the order you answered them.

Question No.					
Marks (<i>For examiners' use only</i>)					Total:

INSTRUCTIONS TO CANDIDATES

- You must not take answer books, used or unused, from the examination room.**
- Write on both sides of the paper.
- Write only in black or blue pen **and in English**.
- Begin each answer on a separate page.**
- Carefully complete the information for each section**
- Do all rough work in the answer book – **do not tear out any pages**.
- If you use Supplementary Answer Books, tie them to the end of this book. Do not write answers in an additional answer book until you have used all of the pages in this book
- Read the instructions on the inside cover.**

Write clearly and legibly.

Instructions

Before the start of the examination

- 1) Place your BUPT and QM student cards on the corner of your desk so that your picture is visible.
- 2) Put all bags, coats and other belongings at the back/front of the room. All small items in your pockets, including wallets, mobile phones and other electronic devices must be **placed in your bag in advance. Possession of mobile phones, electronic devices and unauthorised materials is an offence.**
- 3) Please ensure your mobile phone is switched off and that no alarm will sound during the exam. **A mobile phone causing a disruption is also an assessment offence.**
- 4) Do not turn over your question paper or begin writing until told to do.

During the examination

- 1) You must not communicate with or copy from another student.
- 2) If you require any assistance or wish to leave the examination room for any reason, please raise your hand to attract the attention of the invigilator.
- 3) If you finish the examination early you may leave, but not in the first 30 minutes or the last 10 minutes.
- 4) For 2 hour examinations you may **not** leave temporarily.
- 5) For examinations longer than 2 hours you **may** leave temporarily but not in the first 2 hours or the last 30 minutes.

At the end of the examination

- 1) You must stop writing immediately – **if you continue writing after being told to stop, that is an assessment offence.**
- 2) Remain in your seat until you are told you may leave.

[25 marks]

- [5 marks]**

[illegible]

b) Explain the functions of the three devices below and indicate which layer they operate at.

- i. Repeater
- ii. Router
- iii. Bridge

[6 marks]

[illegible]

c) In the context of multiple access technologies, answer the following questions:

- i) What is Carrier Sense Multiple Access (CSMA)?

[4 marks]

- ii) How is collision window used in CSMA/Collision Detection (CSMA/CD)?

[4 marks]

i)	Do not write in this column

4 marks

- d) An IEEE 802.3 CSMA/CD network is designed with a maximum one-way propagation delay of 2ms and a bit-rate of 10Mbps. Calculate the minimum size of the frame.

[6 marks]

[illegible]

[25 marks]

- [5 marks]**

[illegible]

b) Address Resolution Protocol (ARP)

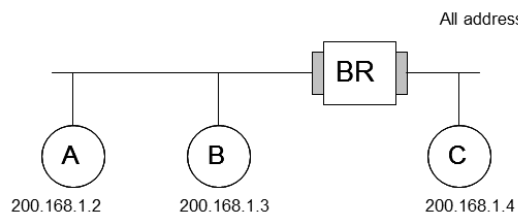


Figure 1a

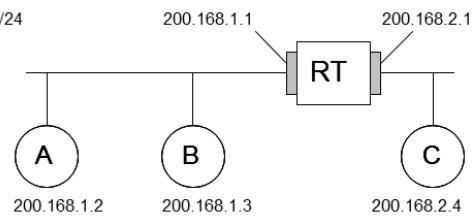


Figure 1b

- i) Describe how host computer 200.168.1.2 is able to deliver Internet Protocol datagrams to host 200.168.1.4 on the same Ethernet network, via bridge BR, illustrating your answer with reference to Figure 1a. Your answer should include a full description of the role played by the ARP and assume that no previous communication has taken place for some time.

[6 marks]

[illegible]

- ii) The bridge is now replaced with a router RT, as shown in Figure 1b. Explain any differences that would arise in the process of how host 200.168.1.2 delivers data to host 200.168.2.4. Once again, assume that no previous communication has taken place for some time.

[5 marks]

[illegible]

- c) With reference to Figure 2, use Dijkstra's algorithm to produce the Shortest Path Tree at Node C, assuming all link costs are 1 except for RC-RF and RD-RE at cost 2, and RE-RD at cost 3.

[9 marks]

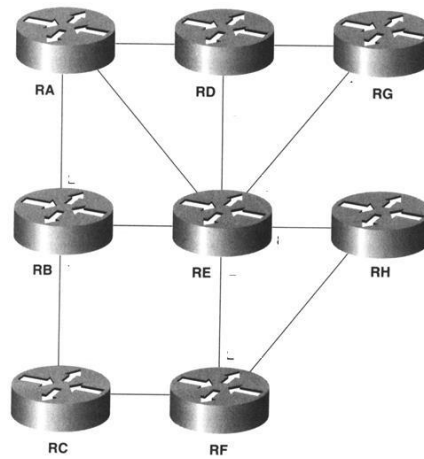


Figure 2

[illegible]

[illegible]

Question 3

[25 marks]

- a) With the aid of diagrams, explain the differences between connection-oriented networking and connectionless networking.

[7 marks]

[illegible]

b) Transport protocols

i) With the aid of a diagram where appropriate, explain how Go-Back-N Protocol works.

[7 marks]

[illegible]

- ii) Formulate the calculation of the utilisation efficiency of Go-Back-N protocol with N number of packet transmitted in a pipeline.

[5 marks]

[illegible]

- [6 marks]**

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[25 marks]

- [7 marks]**

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ii) What can be deduced from the reception of duplicate acknowledgements?

[3 marks]

[illegible]

iii) How is this information used in TCP Reno to maintain channel utilisation?

[2 marks]

	Do not write in this column
	2 marks

- b) Explain the forwarding mechanism of Multi-Protocol Label Switching (MPLS), with the references of Forwarding Equivalence Class (FEC), Label Switched Path (LSP) and the terms: *pushing*, *swapping* and *popping*.

[8 marks]

[illegible]

- c) What is the purpose of Internet Control Message Protocol (ICMP) and explain how Type-3 messages are used for Path Maximum Transfer Unit (MTU) Discovery.

[5 marks]

[illegible]

End of the paper