UNIVERSITY OF BIRMINGHAM

School of Computer Science

Final Year - BSc Artificial Intelligence and Computer Science
Undergraduate Affiliate Computer Science/Software Engineering
Final Year – BSc Computer Science
Fourth Year – MSci Computer Science
Final Year – MEng Computer Science/Software Engineering
Third Year – BSc Mathematics & Computer Science
Third Year – MSci Mathematics & Computer Science
Fourth Year – BSc Computer Science with Study Abroad
Fourth Year – MSci Mathematics & Computer Science
First Year – BSc Computer Science with Industrial Year
First Year – MEng Computer Science/Software Engineering with Industrial Year
First Year – BSc Artificial Intelligence and Computer Science with Industrial Year
First Year – BSc Computer Science with Business Management with Industrial Year
Third Year – MSci Computer Science with Industrial Year

06 26951

Networks

Summer May/June Examinations 2017

Time allowed: 2 hours

[Answer ALL Questions]

1 IP uses network addresses of different lengths for versions 4 and 6.

(a) What are these lengths? [4%]

(b) What was the problem which made the designers of IPv6 opt for a different address length to that in IPv4? [4%]

(c) What mechanism is used by routers, particularly consumer routers, to mitigate this problem with IPv4? Describe how it works, with attention to both UDP and TCP traffic. This mechanism is not defined for IPv6: why is this a concern for some applications? [12%]

2 TCP uses a variety of mechanisms to ensure that data can make best use of the available bandwidth between communicating machines. Some of these mechanisms are used during the whole lifetime of the connection, some of them at particular phases during the connection's lifetime.

(a) Describe the mechanism TCP originally defined to ensure that enough data flows during the overall lifetime of the connection to make good use of the bandwidth available. [10%]

(b) Describe the mechanism TCP uses during the early stages of a connection to ensure that intermediate routers are not overloaded. [10%]

3 Today, Ethernet is the dominant technology for moving packets between machines on the same network.

(a) Describe the performance and security advantages of Ethernet switching over the use of a single coaxial cable. [6%]

(b) VLANs can be used to aggregate traffic. Describe what a VLAN is, and explain one scenario in which it might be used. [6%]

(c) Link aggregation can be used to improve reliability and available bandwidth in a network. How is it used? [4%]

(d) How can it be combined with VLANs to further improve reliability? [4%]

4 The Domain Name Service translates between keys and values, stored in resource record sets.

(a) Give three examples of data stored within the DNS, and how that data is used by computers that need to communicate. [6%]

(b) The DNS contains a mixture of, amongst other things, recursive and authoritative servers. Describe the role of recursive and authoritative servers, and how they interact when a name is being translated to a network address byby an application. [6%]

(c) DNS resource record sets contain Time To Live fields. What are these used for, and what effect might a TTL which was excessively long have on the operation of services? [8%]

5 Multipath TCP is an emerging standard, designed to improve performance and reliability; it addresses the wide range of circumstances in which there are multiple paths possible between two nodes, at least one of which has multiple interfaces.

(a) Why are devices with multiple interfaces an increasing issue in 2017? [4%]

(b) What issues arise when a device switches between multiple networks? Why does Multipath TCP simplify this issue? [6%]

(c) When Multipath TCP is widely deployed it will be possible to have long-lived TCP connections which survive devices moving between locations. How might this alter the design of mobile applications? [10%]

Do not complete the attendance slip, fill in the front of the answer book or turn over the question paper until you are told to do so

Important Reminders

- Coats/outwear should be placed in the designated area.
- Unauthorised materials (e.g. notes or tippex) must be placed in the designated area.
- Check that you do not have any unauthorised materials with you (e.g. in your pockets, pencil case).
- Mobile phones and smart watches **must** be switched off and placed in the designated area or under your desk. They must not be left on your person or in your pockets.
- You are not permitted to use a mobile phone as a clock. If you have difficulty seeing a clock, please alert an Invigilator.
- You are not permitted to have writing on your hand, arm or other body part.
- Check that you do not have writing on your hand, arm or other body part – if you do, you must inform an Invigilator immediately
- Alert an Invigilator immediately if you find any unauthorised item upon you during the examination.

Any students found with non-permitted items upon their person during the examination, or who fail to comply with Examination rules may be subject to Student Conduct procedures.