
Examiners' commentaries 2016–17

C02222 Data communications and enterprise networking – Zone A

General remarks

The assessment is set with the intention of determining whether candidates have achieved the principal objectives of the course. In particular, whether they have acquired the key concepts and technologies that underpin data communications, and can apply this knowledge to solve technical and business problems. The examination paper is divided into two parts, Part A and Part B, and candidates are required to attempt four questions, two from each section.

The following commentary details the main elements of the examination paper on a question-by-question basis, highlighting important aspects and suggesting, where appropriate, what is expected in a 'good' answer and where problems have arisen. All questions followed a similar format, starting with a simple true/false section which was followed by a number of subsections, each with a specific focus. The format of the examination was a little different to that of previous years as there were generally fewer subsections in each question and individual questions covered a broader range of material rather than focusing on particular themes. There was also a greater emphasis on descriptive material rather than calculation-type questions.

Important: please focus on papers from previous years in your revision, particularly calculation-type questions, as this paper was not representative (this was taken into account in the marking).

The true/false sections remained, as in previous years, and no comment is made in respect of these as they simply involve knowledge of specific facts contained in the subject guide. The only advice that can be given by way of help with these is to read the subject guide thoroughly.

Comments on specific questions

Question 1

This question was concerned with aspects of data transmission at a signal and file transfer level. The first part of the question was concerned with delay, specifically in relation to signal transmission (i.e. issues related to the physical or data link layers). Many candidates made the mistake of including delays that occur at the higher layers (e.g. routing delays). A good answer would have included factors such as transmission and propagation delay, delays due to multiplexing (e.g. waiting for access to a channel), errors (e.g. collisions, corruption, etc. requiring retransmissions) and things such as flow control mechanisms.

The second part of the question required a simple description of the Network File System (NFS), together with an example of its use. Good coverage of this is provided in the subject guide.

Question 2

This question comprised three subsections concerned with issues of data transfer. The first part of the question asked candidates to name the three different ways in which the transport layer may be implemented, and to provide two practical examples of how it is implemented in the two dominant operating systems in use today. This is covered well in the subject guide.

The next part of the question involved the solution to a Spanning Tree problem. Unfortunately, some of the network costs were missing from the final printed examination paper, so flexibility was given when marking this question to allow any choice of value for those that were omitted. Some values were printed correctly and the best solutions made use of this information when assigning the missing costs. For example, costs of 5 and 15 were included for the 10G and 1G networks respectively, so a reasonable assumption was that the 100M and 10M networks would have had costs of 25 and 35 (the actual values were 25 and 45).

The final section asked for a description of a network based on virtual circuit operation and application. Many candidates confused this with either Virtual LANs (VLANs) and, to a lesser extent, Virtual Private Networks (VPNs). A good answer would have included a description of a connection-oriented mode of operation, for example, an Asynchronous Transfer Mode (ATM), whereby a route is established prior to any data transfer and maintained for the duration of the transfer. Note also that 'cases' were asked for, so examiners were expecting at least two examples showing where a virtual circuit mode of operation would be desirable (e.g. a telephone call, video or other real-time transfers).

Question 3

This question also comprised three subsections and focused on protocols. Much of the question was descriptive and is covered well in the subject guide, but candidates were also asked to provide examples of where the protocols might be used. In such cases it is expected that answers will not simply name them but will also include some explanation and justification.

The final section asked for the two modes in which IP Security (IPsec) can operate. They are the transport and tunnel modes, but there appeared to be some significant confusion with this part of the question with a variety of incorrect answers.

Question 4

This was the first question in Part B of the examination paper.

The first two subsections of this question were concerned with transmission impairments, and how they may be addressed through error checks and cancellation and suppression techniques. The final part of the question also concentrated on the physical and data link layers, with aspects of transparent bridges.

This was an entirely descriptive question, with all aspects being covered in detail in the subject guide.

Question 5

This question was largely concerned with aspects of network operation, in particular, routing and testing. The question was largely descriptive, but part (c) asked for the difference between a router and a gateway. For questions of this type, a tabular format is very effective in presenting comparisons or differences. It helps to ensure that for each feature of the elements (e.g. a router), there is a clear link to the corresponding feature in the other element (e.g. a gateway). It is not enough to just give a description of both elements without explaining a clear connection between them or specifying how they compare or contrast.

The final part of the question asked for three approaches to network testing. A variety of answers are possible but it should be noted that 'approaches' is a key aspect of this question. A list of devices (e.g. multimeter) does not constitute an approach, but hardware testing, protocol testing, stress testing and so on are all valid answers.

Question 6

The final question continued the themes of routing and addressing, but also considered the management issue of costs. This question was also primarily descriptive and so is covered in detail in the subject guide, but the second element of part (c) asked candidates to discuss what measures could be taken to reduce the total cost of ownership. In general, this part of the question was not answered well and most focused on low-level type savings (e.g. buying cheaper computers). The initial cost of hardware is usually only a small part of the total cost of ownership and savings made there will often incur far greater costs in maintenance over its period of use. Factors such as standardisation, centralisation, outsourcing of certain functions and so on are typical areas where longer term costs can be reduced.

The final part of this question also appeared to cause some confusion. Isolated routing is, as the name suggests, where a router does not base its routing decisions on any input or consideration of the external status of the network. Examples include flooding and hot-potato routing.

Summary

The above commentary has attempted to highlight the main features and some of the common problems that arose with the 2016–17 examination paper. Some general issues have been identified and are summarised here.

- Read the question carefully to understand what the examiners are asking. For example, the difference between 'describe', 'explain', 'compare' and so on, and the importance of such words as 'mode' and 'approach'.
- Note the number of marks available for individual parts of a question and provide answers with appropriate detail.
- Practise solutions to common practical problems (e.g. Spanning Tree).
- Read the subject guide (several times if necessary!).

Examiners' commentaries 2016–17

C02222 Data communications and enterprise networking – Zone B

General remarks

The assessment is set with the intention of determining whether candidates have achieved the principal objectives of the course. In particular, whether they have acquired the key concepts and technologies that underpin data communications, and can apply this knowledge to solve technical and business problems. The examination paper is divided into two parts, Part A and Part B, and candidates are required to attempt four questions, two from each section.

The following commentary details the main elements of the examination paper on a question-by-question basis, highlighting important aspects and suggesting, where appropriate, what is expected in a 'good' answer and where problems have arisen. All questions followed a similar format, starting with a simple true/false section which was followed by a number of subsections, each with a specific focus. The format of the examination was a little different to that of previous years as there were generally fewer subsections in each question and individual questions covered a broader range of material rather than focusing on particular themes. There was also a greater emphasis on descriptive material rather than calculation-type questions.

Important: please focus on papers from previous years in your revision, particularly calculation-type questions, as this paper was not representative (this was taken into account in the marking).

The true/false sections remained, as in previous years, and no comment is made in respect of these as they simply involve knowledge of specific facts contained in the subject guide. The only advice that can be given by way of help with these is to read the subject guide thoroughly.

Comments on specific questions

Question 1

This question was concerned with aspects of data access. The first part of the question was concerned with switching, specifically in relation to end-to-end communication, that is, issues related to the physical or data link layers. Many candidates made the mistake of describing how switches work and how they compare to routers. Instead a good answer would have included a brief description to explain the operation of circuit, packet and message switching.

The second and third parts of the question asked about the purpose of the Domain Name System (DNS) and how TCP deals with flow control. Good coverage of both of these topics is provided in the subject guide.

Question 2

This question comprised three subsections, concerned with a range of issues, from network addressing, error detection through to modems. The first part of the question asked candidates to discuss the difference between subnetting and supernetting, with practical examples. The next part of the question required a description of Longitudinal Redundancy error checking and the final part, ADSL modems.

This was an entirely descriptive question, with all aspects covered in the subject guide. The last section on ADSL presented a few problems in that a significant number of answers discussed WiFi and mobile communications. Rather, a description of the operation of the modem and how it interfaces with the Public Switched Telephone Network (PSTN) was required.

Question 3

The majority of marks for this question were available for a comparison of the four modes in which switched Ethernets operate. For questions of this type, a tabular format is very effective in presenting comparisons or differences. It helps to ensure that for each feature of the elements (e.g. switching modes), there is a clear link to the corresponding feature in the other elements. It is not enough to just give a description of the four modes without explaining a clear connection between them or specifying how they compare or contrast. The four modes expected were store and forward, cut-through, fragment free and adaptive.

The final section involved a Dijkstra routing problem. These appear frequently and generally caused few problems, other than candidates simply marking the shortest path, without labelling each of the nodes. The majority of the marks were awarded for these labels, with only a single mark for marking the shortest route.

Question 4

This was the first question in Part B of the examination paper.

This question was largely concerned with aspects of network implementation. It begins with how the PSTN deals with transient high demand for a particular number. A range of answers were presented, but only a minority correctly related this to the circuit switched nature of the PSTN, and how engaged tones are returned for busy numbers. A significant number of solutions described the Signalling System Number 7 (SS7) protocol in some detail, which was not required, and some confused the PSTN with the Ethernet and discussed 'dropping packets'.

The remaining two subsections of this question, in contrast, caused few problems. Part (c) required a comparison of Distance Vector and Link State routing, and Part (d), a brief explanation of functionality, performance, reliability and cost in relation to network design.

Question 5

This question was concerned with a variety of topics, ranging from network migration, through mobile communications protocols, to signal impairments. Part (b) posed a scenario for a network upgrade and required candidates to show how the migration from the current network to the new network would be best achieved. Many candidates provided full answers detailing how the redesign should proceed, but said nothing about migration. A good answer showed a comparison of techniques ranging from a pilot, parallel through to a big bang approach.

The final part of the question asked for a discussion of three impairments that occur at the physical layer (i.e. that affect signal transmission) and show the need for error control. A significant number of solutions described problems that arise at other layers (e.g. dropped packets due to congestion), while others provided descriptions of error detection techniques which were not required. The main physical layer impairments are noise, attenuation and echoes.

Question 6

The final question continued the themes of operation and protocols. This question was entirely descriptive and all the material is covered in detail in the subject guide.

Part (b) of the question, concerned with Virtual LANs (VLANs), drew a variety of answers that were more focused on the end user rather than the network manager. Instead, a reasonably technical answer was required, based on such features as Media Access Control (MAC), IP and multicast IP addresses, switch port numbers and transport layer numbers (that define which applications a group member can access).

The answers to parts (c) and (d) were quite straightforward but variable in their completeness and/or quality (e.g. many of the answers to the Token Ring question were very brief).

Summary

The above commentary has attempted to highlight the main features and some of the common problems that arose with the 2016–17 examination paper. Some general issues have been identified and are summarised here.

- Read the question carefully to understand what the examiners are asking. For example, the difference between ‘describe’, ‘explain’, ‘compare’ and so on, and the importance of such words as ‘mode’ and ‘approach’.
- Note the number of marks available for individual parts of a question and provide answers with appropriate detail.
- Practise solutions to common practical problems (e.g. Dijkstra’s algorithm).
- Read the subject guide (several times if necessary!).