Examiners' commentaries 2015–16

CO2222 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 learned the key concepts and technologies that underpin data communications, and if this knowledge can be applied to the solution of technical and business problems. The examination paper is divided into two parts, with Part A focussing mainly on data communications technology and Part B on how this technology is employed to create enterprise networks. Candidates are required to attempt four questions, two from each section of the paper.

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 may have arisen. All questions followed a similar format, starting with a simple true/false section and then a number of subsections, each with a specific focus. No comment is made in respect of the true/false sections; these 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. The first three parts were largely descriptive and were based on material contained in the subject guide.

The next part required candidates to apply knowledge that they would have gained from the course to the solution of a specific problem – in this instance, under which circumstances UDP would be chosen as a delivery protocol over alternative services. When dealing with questions of this type, examples should be used to illustrate your answer (e.g. for streaming video where throughput is more important than 100 per cent data fidelity).

The question concluded with a Huffman code problem. This topic occurs quite frequently and there is no substitute for attempting a few problems involving Huffman codes during your revision. There are really only two basic types of problem; given a Huffman tree, recover the data string represented by a Huffman code or, given the code (usually in the form of a table), draw the corresponding tree and encode a specified data string. The latter problem type was chosen for this question. These problems are generally quite straightforward to answer, but significant marks can be lost by failing to provide what the examiners have asked for (e.g. in this question, candidates were asked to draw the Huffman tree, even though the given data string could have been encoded directly from the table).

Question 2

The main focus for this question was data integrity and, in particular, error detection and framing. Much of the question was descriptive, for which thorough revision and careful reading of the question have no substitute. While this might sound obvious, it is important to estimate how much detail the examiners are expecting. A good guide is the number of marks allocated to each element of each question. For example, in this question nine marks were available for the description of TCP and UDP error detection, whereas only six were given to vertical redundancy checks.

Question 3

This question covered aspects of data transmission. It involved a number of 'explain' and 'describe' elements and candidates need to be aware of the distinction. An explanation requires some level of description, but the focus is on why things are done that way. For example, for part (b) the solution should comment on the fact that errors can and do appear when data is transmitted over communications networks and these must be detected and corrected. A description of Automatic Repeat Request (ARQ) and Forward Error Correction (FEC) would then say how this could be achieved.

The question concluded with a very simple numerical evaluation of data rates and a definition of Shannon's law. In this example, the baud (or symbol) rate will be 1/5 of the bit rate, hence the two stated rates are the same.

Question 4

This was the first question in Part B of the examination paper, which is primarily concerned with enterprise networks and their implementation.

The question began with issues of product life cycle and then moved on to the more technical topics of Virtual LANs, synchronisation and intelligent networks. As with previous questions, thorough revision is the best preparation for descriptive solutions, together with a careful reading of what is being asked for and consideration of the distribution of marks (e.g. for part (d), five differences were expected). Candidates should also practise 'application' exercises and review coursework submissions.

Question 5

This question was largely concerned with aspects of internetworking and routing. Much of the question was descriptive, involving some quite technical aspects (e.g. flooding) and a Spanning Tree problem.

Spanning Tree problems appear frequently and, generally, are not answered well. They are in fact much less complicated than they appear. A good description is given in the subject guide, with the four key steps listed in order:

1. Identify the root bridge.
2. Taking each bridge in turn, identify and label the root paths.
3. Check each network segment and for those that do not have a complete path to the root bridge, identify and label the designated paths. Note, the path weightings for these network segments are calculated as though the attached bridge had sent a packet in that direction (i.e. towards the subnetwork you are considering) to the root bridge.
4. Mark all unused paths with an X.

If this sequence of steps is followed methodically, the solution to such problems is quite straightforward. As with some of the earlier questions, there is no substitute for prior practise with these types of problem in order to refine your technique.

Question 6

The final question examined issues associated with network operation, design and management. More than half of the marks were available for descriptive work, guidance for which has been given earlier in this commentary.

The question included a problem on applying Dijkstra's algorithm to find the shortest path through a network. Like the Spanning Tree above, problems based on this algorithm appear frequently on examination papers. It is vital with questions of this sort to include all of the workings involved. With Dijkstra's algorithm, for example, all the nodes should be labelled as the path is developed and the majority of marks will be awarded for these labels, with perhaps only one mark for identifying the actual path. The subject guide provides a number of useful examples to aid your revision for this topic.

Summary

The above commentary has attempted to highlight main features and some of the common problems that arose with the 2015–16 examination paper, to help candidates prepare for future examinations. Some general and fairly generic issues have been commented on, summarised here.

- Understand the difference between 'describe', 'explain', 'compare' etc.
- Note the number of marks available for individual parts of a question and provide answers of an appropriate length.
- Practise solutions to common practical problems (e.g. Nyquist/Shannon/dB calculations, Hamming and Huffman codes, Spanning Tree, Dijkstra's algorithm etc.).

Examiners' commentaries 2015–16

CO2222 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 learned the key concepts and technologies that underpin data communications, and if this knowledge can be applied to the solution of technical and business problems. The examination paper is divided into two parts, with Part A focussing mainly on data communications technology and Part B on how this technology is employed to create enterprise networks. Candidates are required to attempt four questions, two from each section of the paper.

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 may have arisen. All questions followed a similar format, starting with a simple true/false section and then a number of subsections, each with a specific focus. No comment is made in respect of the true/false sections; these simply involve knowledge of specific facts contained in the subject guide. The best 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. The first three parts were largely descriptive and were based on material contained in the subject guide.

The next part required candidates to apply knowledge that they would have gained from the course to the solution of a specific problem – in this instance, to explain how data encoding is dealt with at the application layer of the OSI model, using ASN.1. A good solution here provided a summary of the issues around data encoding, the features of ASN.1 and how it may be used for specifying protocols.

The question concluded with a Huffman code problem. This topic occurs quite frequently and there is no substitute for attempting a few problems involving Huffman codes during your revision. There are really only two basic types of problem; given a Huffman tree, recover the data string represented by a Huffman code or, given the code (usually in the form of a table), draw the corresponding tree and encode a specified data string. The latter problem type was chosen for this question. These problems are generally quite straightforward to answer, but significant marks can be lost by failing to provide what the examiners have asked for (e.g. in this question, candidates were asked to draw the Huffman tree, even though the given data string could have been encoded directly from the table).

Question 2

The main focus for this question was data integrity and, in particular, data delivery and the associated error detection and framing. Much of the question was descriptive, for which thorough revision and careful reading of the question have no substitute. While this might sound obvious, it is important to try to estimate how much detail the examiners are expecting. A good guide is the number of marks allocated to each element of each question. For example, in this question the distribution of marks was fairly even, so a roughly equal amount of detail was expected for each element.

Question 3

This question covered aspects of data transmission. It was largely descriptive and concerned with transmission mediums and access control mechanisms. Part (c) gave rise to some confusion. What the examiners were looking for here was a description of random (e.g. CSMA/CD), controlled (e.g. CSMA/CA) and centralised (e.g. circuit switching) as the three main types of medium access control methods employed by the data link layer.

The question concluded with an explanation of the Link Control Protocol. It is important to understand the difference between an 'explanation' and 'description'. An explanation will include some description of important features, but should also go on to say 'why' those features are important.

Question 4

This was the first question in Part B of the examination paper, which is primarily concerned with enterprise networks and their implementation.

The question began with issues of product market segments and then moved on to the more technical topics of Virtual LANs, synchronisation and the Frame Relay Protocol. As with previous questions, thorough revision is the best preparation for these descriptive solutions, together with a careful reading of what is being asked for and the distribution of marks (e.g. for part (d) three marks were available for the description of the protocol, three for the comparison with other protocols and three for the error checking process).

Question 5

This question was largely concerned with aspects of internetworking and routing. Much of the question was descriptive, involving some quite technical aspects (e.g. distance vector routing) and a Spanning Tree problem.

Spanning Tree problems appear frequently and, generally, are not answered well. They are in fact much less complicated than they appear. A good description is given in the subject guide, with the four key steps listed in order:

1. Identify the root bridge.
2. Taking each bridge in turn, identify and label the root paths.
3. Check each network segment and for those that do not have a complete path to the root bridge, identify and label the designated paths. Note, the path weightings for these network segments are calculated as though the attached bridge had sent a packet in that direction (i.e. towards the subnetwork you are considering) to the root bridge.
4. Mark all unused paths with an X.

If this sequence of steps is followed methodically, the solution to such problems is quite straightforward. As with some of the earlier questions, there is no substitute for some prior practise with these types of problems in order to refine your technique.

Question 6

The final question was mainly concerned with issues associated with network routing. The majority of marks were available for descriptive work, guidance for which has been given earlier in this commentary.

The question included a problem on applying Dijkstra's algorithm to find the shortest path through a network. Like the Spanning Tree above, problems based on this algorithm appear frequently on exam papers. It is vital with questions of this sort to include all of the workings involved. With Dijkstra's algorithm, for example, all the nodes should be labelled as the path is developed and the majority of marks will be awarded for these labels, with perhaps only one mark for identifying the actual path. The subject guide provides a number of useful examples to aid your revision for this topic.

Summary

The above commentary has attempted to highlight main features and some of the common problems that arose with the 2015–16 examination paper, in the hope that it will help candidates prepare for future examinations. Some general and fairly generic issues have been commented on, summarised here.

- Understand the difference between 'describe', 'explain', 'compare' etc.
- Note the number of marks available for individual parts of a question and provide answers of an appropriate length.
- Practise solutions to common practical problems (e.g. Nyquist/Shannon/dB calculations, Hamming and Huffman codes, Spanning Tree, Dijkstra's algorithm etc.).