PRIFYSGOL ABERYSTWYTH UNIVERSITY

SEMESTER ONE 2026

COMPUTER SCIENCE

CS25820 : SYSTEM AND NETWORK SERVICES ADMINISTRATION

Time allowed: **2 HOURS**

Answer **THREE** from **FIVE** questions.

All questions carry equal marks.

YOU MAY BRING THE FOLLOWING INTO THE EXAMINATION:
UP TO 3 SHEETS OF NOTES ON A4 PAPER (WHICH MAY BE DOUBLE-SIDED). THERE ARE NO ADDITIONAL RESTRICTIONS ON CONTENT OR FORMATTING OF THESE NOTES.
NO ELECTRONIC DEVICES.

CALCULATORS ARE NOT PERMITTED.

STUDENTS MAY SUBMIT ANSWERS TO THIS PAPER IN EITHER WELSH OR ENGLISH

Once seated, students may complete the front cover of the answer book(s) and the attendance slip ONLY.

DO NOT TURN THE EXAMINATION QUESTION PAPER OVER UNTIL INSTRUCTED TO DO SO.

1. You are the IT services manager for an innovative high technology company based in the UK. The organisation plans to invest heavily in high power server technology to support a new compute-intensive research direction. Given the nature of the research, the company insists that all data-processing is carried out on-site.

   You have been asked by the Chief Executive to lead the design and development of a new facility to house this large server population.

   a) Write a non-technical report, which will be submitted to the Management Board, outlining what you consider to be the three key physical design criteria for the facility. [18 marks]

   b) For ONE of the criteria, write a technical brief which discusses how this issue should be addressed in the specification, development and on-going management of the new facility. [15 marks]

      You should state any assumptions that you make.

2. You are the IT service manager for a medium sized company based in the centre of a major city in Western Europe.

One Monday morning, you are trying to get to work by public transport. You are a few hundred metres from your office building when you find that all the streets around the building are blocked by Police wearing chemical/biological protective equipment.

Access to the area is completely restricted – as the Police have received notification that a number of staff in a building nearby have become seriously ill with an unknown condition, possibly caused by a virus. There is no estimate as to when access will be possible.

You manage to contact most of your team by phone and you meet in a café to discuss your next move. It is clear from the discussion that your business continuity plan is wholly inadequate to deal with a problem on this scale.

a) Make an annotated list of the first five activities you will carry out in response to this situation. [20 marks]

b) Fortunately, the warning turns out to be exaggerated. The sick staff are found to be suffering from a common flu virus – unpleasant but not especially dangerous – and you are able to return to your office before the close of business. The episode has caused significant concern to senior management, however, and they are keen to see a review of your business continuity plan.

Write a memo to the Chief Executive describing in detail a plan which could protect you business if a similar situation arose in the future. [13 marks]

3. This question is about software selection and email.

a) The National Archives and Digital Preservation Agency (NADPA) of (the mythical nation of) Cantre'r Gwaelod has been tasked with modernising its operations to better preserve and share the country's cultural and historical records. The agency is establishing a new digital department to manage archives, develop public-facing digital exhibits, and engage with researchers and the public online.

This initiative requires significant investment in both hardware and software for the new department, which will employ around 50 staff. The team will include Digital archivists (requiring some specialist software), Web developers and designers, IT administrators, and Public engagement officers (social media and outreach).

You have been hired as a consultant to recommend software solutions for this department. The government has no pre-existing preferences and is primarily concerned with minimizing costs–including purchase, licensing, and staff training.

(i) Propose two software solutions for the department's user software:

1. A safe, conventional solution.
2. A radical, innovative solution that challenges traditional approaches but could offer long-term benefits.

For each solution, provide arguments for and against, considering the needs of all staff categories. Address any assumptions you make.

[15 marks]

(ii) Should NADPA outsource its server needs, or run its own servers? Justify your choice. [3 marks]

b) The Ministry of Digital Communication of Cantre'r Gwaelod is setting up a new email system for its employees. The IT team is evaluating the use of POP3, IMAP, and SMTP protocols, as well as strategies to combat spam.

(i) Explain the key differences between POP3 and IMAP in terms of how email is stored, accessed, and managed. Which protocol would you recommend for government employees who need to access their email from multiple devices? Justify your answer. [6 marks]

(ii) The ministry is concerned about the rise of spam and phishing attacks. Briefly describe three techniques that can be used to reduce spam and phishing risks. [9 marks]

4. This question relates to file service management, remote working and the Domain Name System (DNS).

a) Explain, with reference to a Unix file system, the purpose of an inode, and why the choice of the number of inodes should be considered when configuring a file system. [6 marks]

b) In Microsoft's NTFS filesystem, describe the purpose of the Master File Table (MFT) [6 marks]

c) How do these file systems meet the principles of file system design? [6 marks]

d) A company manages shared files across several offices across the country using both Unix and Windows file servers. Remote users rely on DNS to resolve server addresses when connecting to file shares. The company runs its own DNS name servers, but owing to a misconfiguration, the servers resolve the shares with incorrect IP addresses. The issue is noticed and the information corrected in the name servers. However, remote users in several locations remain unable to connect to the remote servers, although some other remote workers elsewhere are unaffected.

(i) Why are only some users affected? [5 marks]

(ii) Describe any action the remote users can take to regain access. [5 marks]

(iii) What steps could be taken to reduce the impact of an issue like this in the future, and what are the downsides (if any) of your solution. [5 marks]

5. This question is about secure web services.

a) As of 2021 the Electronic Frontiers Foundation (EFF) report that 90% of the Worldwide Web is now encrypted, and many browsers raise security warnings for unencrypted sites. Why doesn't the HTTP protocol offer sufficient protection for secure access or for e-commerce, even when used with web pages that can only be accessed by a password and from particular IP addresses? [8 marks]

b) Describe how Secure Sockets Layer/Transport Layer Security (SSL/TLS) makes use of both Public Key Encryption and Symmetric Encryption to secure communications to web sites and other services. In your answer you should explain why SSL/TLS uses a combination of public key encryption and symmetric encryption, rather than relying on one or the other. [13 marks]

c) In September 2011 it was discovered that the Certificate Authority (CA), Diginotar, was signing Google Gmail certificates, and that this was because the CA had been hacked and lost control of their private key. Explain the role of the CA in SSL/TLS encryption, and discuss how this compromise would undermine the encryption that Google were providing for Gmail users. [12 marks]

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