



University
of Glasgow

Wednesday 12 December 2018
1.00 pm – 2.30 pm
(Duration: 1 hours 30 minutes)

DEGREES of MSci, MEng, BEng, BSc, MA and MA (Social Sciences)

Networks and Operating Systems Essentials 2

Answer All Questions

This examination paper is worth a total of 60 marks

The use of a calculator is not permitted in this examination

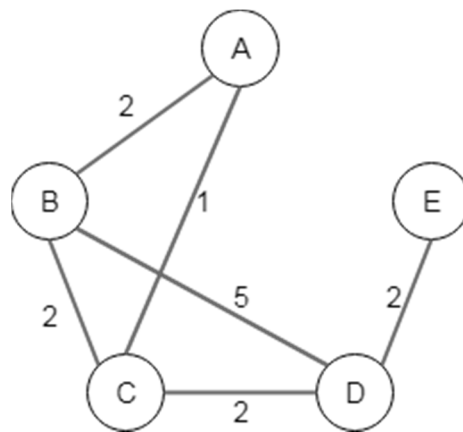
INSTRUCTIONS TO INVIGILATORS

**Please collect all exam question papers and exam
answer scripts and retain for school to collect.
Candidates must not remove exam question papers.**

1. Discuss whether the layer architecture implied by the OSI model is a good way of implementing a networked system, or whether an alternative software architecture would be more suitable. Outline the trade-offs involved in developing software to implement a network protocol stack, giving examples of possible design decisions and their impact if appropriate.

[8 marks]

2. Consider the network graph pictured below. Nodes represent devices on the network, edges represent links and the numbers by the edges represent the cost of forwarding a message across that link. Assume that the network is using a Distance Vector protocol, that all message exchanges happen at the beginning of every round of the protocol, and that hosts update their state after they've received all messages destined to them in the current round. Show the initial routing state of all nodes in the network, and their routing state after every round of the protocol. In your answer please show the routing table entries (distance/next hop) of all nodes in the network (i.e., a 5 x 5 matrix), for each iteration of the algorithm. Your answer should include 3 such matrices, including the one for the original state (i.e., nodes only know of themselves and their 1-hop neighbours).



[12 marks]

3. Discuss how the transport layer can enable reliable connections on the substrate provided by the network layer

[11 marks]

4. Describe how the TLS protocol manages to combine the security of public key cryptography with the speed of symmetric cryptography

[7 marks]

5. Consider a cache with 3 slots and the following stream of requests:

A, B, C, A, B, B, B, A, C, D, B

Give the contents of the cache after each request and indicate cache misses if the cache is using (i) the LRU algorithm and (ii) the LFU algorithm.

[8 marks]

6. Consider the following set of processes, with the length of the CPU burst given in milliseconds:

Process ID	Burst Time	Priority
P1	10	3
P2	1	1
P3	4	4
P4	7	3
P5	2	2

Assume that processes have arrived in the order P1, P2, P3, P4, P5, all at time 0.

Show the scheduling order and execution times of individual process, and compute the turnaround time of each process and the average waiting time over all processes, for each of the following scheduling algorithms: FCFS, SJF, non-preemptive priority (a smaller priority number implies a higher priority), and preemptive RR (quantum = 3).

[14 marks]