Question 1

The development of operating systems can be seen to be closely associated with the development of computer hardware.
Describe the main developments of operating systems that occurred at each computer generation.

(17 Marks)

George 2+ and George 3 were mainframe operating systems used on ICL mainframes. What are the main differences between the two operating systems?

(8 Marks)

Question 2

With regard to process synchronisation describe what is meant by race conditions?

(5 Marks)

Describe two methods that allow mutual exclusion with busy waiting to be implemented. Ensure you state any problems with the methods you describe.

(10 Marks)

Describe an approach of mutual exclusion that does not require busy waiting.

(10 Marks)

Question 3

What is meant by pre-emptive scheduling?

(3 marks)

Describe the following scheduling algorithms
- Non-preemptive, First Come First Served (FCFS)
- Round Robin (RR)
- Multilevel Feedback Queue Scheduling

How can RR be made to mimic FCFS?

(15 marks)

The Shortest Job First (SJF) scheduling algorithm can be proven to produce the minimum average waiting time.
However, it is impossible to know the burst time of a process before it runs. Suggest a way that the burst time can be estimated.

(7 marks)

Question 4

Intuitively, an operating systems that allows multiprogramming provides better CPU utilisation than a monoprogramming operating system. However, there are benefits in a monoprogramming operating system. Describe these benefits.

(7 marks)

We can demonstrate, using a model, that multiprogramming does provide better CPU utilisation. Describe such a model.
Use the model to show how we can predict CPU utilisation when we add extra memory.

Graph paper is supplied for this question, should you need it.

(18 marks)

Question 5

The buddy system is a memory management scheme that uses variable sized partitions.

Explain the basic principle behind the buddy system.

Assume a computer with a memory size of 256K, initially empty. Requests are received for blocks of memory of 5K, 25K, 35K and 20K. Show how the buddy system would deal with each request, showing the memory layout at each stage.

After allocating all the processes, what would be the effect of the 25K process terminating and returning its memory?

(17 marks)

Describe and evaluate an alternative to the buddy system

(8 marks)

Question 6

Describe two file system implementations that use linked lists. Describe the advantages and disadvantages of each method.

(12 marks)

Describe the I-node method of implementing a file system.

(8 marks)

It has been suggested that the first part of each UNIX file be kept in the same disk block as its I-node. What, if any, would be the advantage of doing this?

(5 marks)