Operating Systems Test 2 Model Answers

Question 1

a) Define the following evaluation criteria in the context of CPU scheduling (5 marks)

- CPU utilization – keep the CPU as busy as possible
- Throughput – number of processes that complete their execution per time unit
- Turnaround time – amount of time to execute a particular process
- Waiting time – amount of time a process has been waiting in the ready queue
- Response time – amount of time it takes from when a request was submitted until the first response is produced, **not** output (for time-sharing environment)

b) Assume you are presented with the following processes, which arrive at time t=0:

Process	Burst time (ms)
P1	9
P2	33
P3	2
P4	5
P5	14

Which of the following algorithms will perform best on this work load? (FCFS, SJF, RR (time quantum = 8ms) (10 marks)

FCFS = 28.8= (0+9+42+44+49)/5 – 3marks

SJF=11 = (0+2+7+16+30)/5 – 3 marks

RR=42.8 = (31+86+16+18+63)/5 – 3 marks

SJF will perform best coz it has the shortest waiting time -1 mark

Question 2

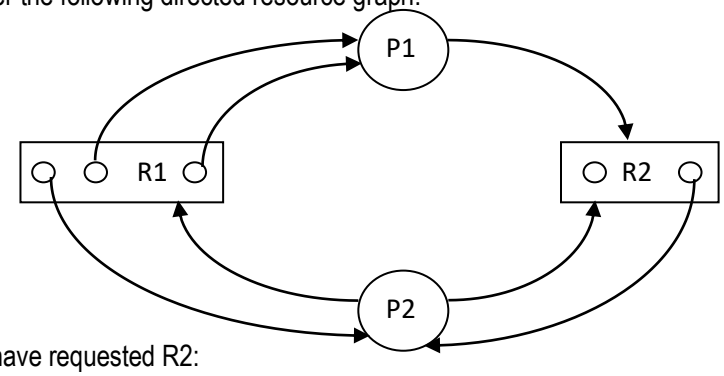
a) Explain the 4 conditions that must hold for a deadlock to occur. **(8 marks)**

A set of blocked processes each holding a resource and waiting to acquire a resource held by another process in the set

- **Mutual exclusion:** only one process at a time can use a resource.
- **Hold and wait:** a process holding at least one resource is waiting to acquire additional resources held by other processes.

- **No preemption:** a resource can be released only voluntarily by the process holding it, after that process has completed its task.
- **Circular wait:** there exists a set {*P*0, *P*1, …, *P*0} of waiting processes such that *P*0 is waiting for a resource that is held by *P*1, *P*1 is waiting for a resource that is held by *P*2, …, *Pn*–1 is waiting for a resource that is held by *P*n, and *P*0 is waiting for a resource that is held by *P*0.

b) Consider the following directed resource graph: **(4 marks)**



Both PI and P2 have requested R2:

- What is the status of the system if P2's request is granted before P1's? deadlock ?deadlock
- What is the status of the system if P1's request is granted before P2's? no deadlock ? no deadlock

c) What is a deadlock?

A set of blocked processes each holding a resource and waiting to acquire a resource held by another process in the set

d) In recovery from deadlocks, two methods are used. Explain each method highlighting the issues to consider, advantages and disadvantages **(8 marks)**

Process Termination

- Abort all deadlocked processes.
- Abort one process at a time until the deadlock cycle is eliminated.
- In which order should we choose to abort?
  - Priority of the process.
  - How long process has computed, and how much longer to completion.
  - Resources the process has used.
  - Resources process needs to complete.
  - How many processes will need to be terminated?
  - Is process interactive or batch?

Disadvantages

- Increased overhead

Resource Preemption

- Selecting a victim – minimize cost.
- Rollback – return to some safe state, restart process for that state.
- Starvation – same process may always be picked as victim, include number of rollback in cost factor.