1. Consider the following set of processes, with the length of the CPU-burst time given in milliseconds.

process	burst time	priority	arrived time
P1	10	3	1
P2	1	1	3
P3	2	3	4
P4	1	4	5

(1) Draw four Gantt charts illustrating the execution of these processes using FCFS, SRTF, a nonpreemptive priority (smaller priority implies higher priority), and RR (quantum=2) scheduling
(2) Calculate the average waiting time for each algorithm.

2. Consider the following page reference string:
1,2,3,4,2,1,5,6,2,1,2,3,7,6,3
How many page faults would occur for the following replacement algorithms, assuming four frames? Remember all frames are initially empty, So your first unique pages will all cost one fault each.
(1) FIFO replacement
(2) Optimal replacement
(3) LRU replacement

3. Consider the following snapshot of a system:

	Allocation	Max	Available
	A B C D	A B C D	A B C D
P 0	0 0 1 2	0 0 1 2	1 5 2 0
P 1	1 0 0 0	1 7 5 0	
P 2	1 3 5 4	2 3 5 6	
P 3	0 6 3 2	0 6 5 2	
P 4	0 0 1 4	0 6 5 6	

Answer the following questions using the banker's algorithm.
(1) What is the content of the matrix Need?
(2) Is the system in a safe state?
(3) If a request from process P1 arrives for (0,4,2,0), can the request be granted immediately?

4. Given memory partitions of 100K, 500K, 200K, 300K, and 600K (in order), how would each of the First-fit, Best-fit, and Worst-fit algorithms place processes of 212K, 417K, 112K, and 426K (in order)? Which algorithm makes the most efficient use of memory?

5. Consider a logical address space of eight pages of 1024 words each, mapped onto a physical memory of 32 frames.
(1) How many bits are there in the logical address?
(2) How many bits are there in the physical address?