1. [10 points]

You are given the following payoff table (in units of thousands of dollars) for a decision analysis problem:

	State of Nature		
Alternative	S_1	S_2	S_3
A_1	220	170	110
A_2	200	180	150
Prior	0.6	0.3	0.1

(a) [2 points]

Draw the associated decision tree.

(b) [2 points]

Which alternative should be chosen under the maximin payoff criterion?

1.

(c) [2 points]

Which alternative should be chosen under the maximum likelihood criterion?

(d) [4 points]

Which alternative should be chosen under Bayes' decision rule?

2. [10 points]

Simulate the M/M/1 model for 100 arrivals given the arrival rate $\lambda = 3$ customers per hour and the service rate $\mu = 5$ departures per hour. Run 5 replications and determine a 95% confidence interval for all the measures of performance of the model. Compare the results with the steady-state theoretical values of the M/M/1 model.

3. [12 points]

A maintenance person has the job of keeping two machines in working order. The amount of time that a machine works before breaking down has an exponential distribution with a mean of 10 hours. The time then spent by the maintenance person to repair the machine has an exponential distribution with a mean of 8 hours.

(a) [2 points]

Show that this process fits the birth-and-death process by defining the states, specifying the values of the λ_n and μ_n, and then constructing the rate diagram.

(b) [2 points]

Calculate the P_n.

(c) [4 points]

Calculate L, L_q, W and W_q.

(d) [2 points]

Determine the proportion of time that the maintenance person is busy.

(e) [2 points]

Determine the proportion of time that any given machine is working.

4. [8 points]

Consider the instance of $1||\sum w_j C_j$ with the following processing times and weights.

jobs	1	2	3	4	5
w_j	4	2	9	6	5
p_j	4	3	5	7	6

(a) [4 points]

Find the optimal sequence and compute the value of the objective.

(b) [4 points]

Determine the effect of change in p_3 from 5 to 8 on the optimal sequence(s) and the value of the objective.

5. [10 points]

An item sells for \$25 a unit, but a 10% discount is offered for lots of 200 units or more. A company uses this item at the rate of 30 units per day. The setup cost for ordering a lot is \$100, and the holding cost per unit per day is \$0.25. The lead time is 15 days.

(a) [6 points]

Determine the optimal inventory policy.

(b) [2 points]

Should the company take advantage of the discount?

(c) [2 points]

Determine the range on the price discount percentage that, when offered for lots of size 200 units or more, will not result in any financial advantage to the company.