

**Problem 1.**

6 Marks

In a bank operation, the arrival rate is 3 customers per minute. Determine the following:

- (1) The average number of arrivals in 5 minutes.
  
  
  
  
  
  
  
  
  
  
- (2) The probability of no arrival in the next 5 minutes.
  
  
  
  
  
  
  
  
  
  
- (3) The probability that at least one arrival will occur in the next 0.5 minute.
  
  
  
  
  
  
  
  
  
  
- (4) The probability that the time between two successive arrivals is at least 3.5 minutes.



**Problem 3.**

A music store sells compact discs of which the demand is estimated to be normally distributed with mean 200 discs and a standard deviation of 20 discs. The cost of keeping the discs in the store is 0.01 KD per disc per day. It costs 35 KD to place a new order. The supplier normally specifies a 7-day lead time for delivery. Assuming that the store wants to limit the probability of running out discs during the lead time to no more than 0.02, determine the optimal inventory policy.

**Problem 4.**

Find the optimal  $(s, S)$  policy for the problem

$$f(x) = \begin{cases} \frac{1}{18}, & 0 \leq x \leq 18 \\ 0 & \text{otherwise} \end{cases},$$

and the cost are

    Holding= \$1 per item  
    Shortage= \$3 per item  
    Setup= \$1.50  
    Purchasing= \$2 per item

**Problem 5.**

Farmer Said can plant either corn or wheat. The probabilities that the next harvest prices of these commodities will go up, stay the same, or go down are 0.25, 0.30, and 0.45, respectively. If the prices go up, the corn crop will net 8000 KD and the wheat will net 3000 KD. If the prices remain unchanged, Said will break even. But if the prices go down, the corn and wheat crop will sustain losses of 9000 KD and 1000 KD, respectively.

(1) Represent Said's problem as a decision tree.

(2) Which crop should Said plant?

- (3) The farmer has secured additional information from an friend, where he is either favorable or unfavorable for investment. Historical data shows that the friend is favorable 85% of the time if the prices go up, favorable 50% of the time if the prices stay the same, and favorable 15% of the time if the prices go down.
- (a) Draw the associated decision tree.

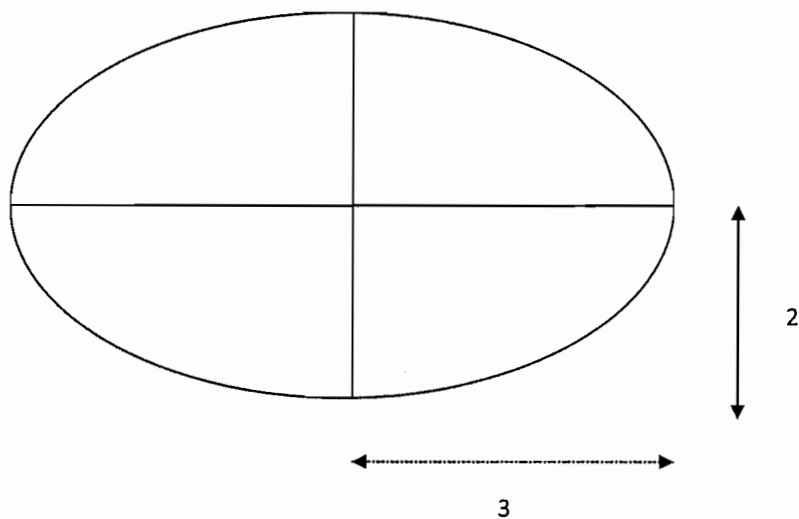
- (b) Find the optimal decision to the problem.



**Problem 7.**

Suppose that the equation of an ellipse is

$$\frac{(x-1)^2}{4} + \frac{(y-2)^2}{9} = 1,$$



where you are required to find the area of the ellipse.

(1) Describe the procedure of generating random points which are inside the ellipse.

(2) Briefly describe a procedure for computing the area of the ellipse using simulation by generating 10 random data points.



