# Operations Management Exam

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**Exercise (7 points)**

To celebrate Christmas Holidays, the marketing manager of CREA, a medium enterprise, decided to organize a big charity event opened to all the employees and their families. The auditorium room of the company has a maximum capacity of 1000 seats, and the manager wants to organize the dinner there.

Two types of tickets are offered to the participants with the intention to maximize the revenues: a discounted ticket that people can buy from 90 days to 20 days before the event at 100 € and a full price one that people can buy from 19 days to the day before the event at 220 €. The demand for tickets sold at 220 € is distributed as a normal distribution with average 500 and probability of 90% to sell less or equal 700 tickets.

Each participant will have the opportunity to participate to the appetizer that costs to the company 10€ and it is paid one week after the event by CREA. Based on historical data, the manager knows that the 80% of full price tickets and the 90% of the discounted price tickets will take part to the appetizer. Moreover, CREA will offer to all the participants the dinner that costs 35 € and it is paid 10 days before the event by the company.

To disseminate the information about how the money collected will be used for charity, the manager has decided to print 1000 flyers for 3 € each to be distributed to all the participants during the event. The flyers are paid before the event.

Moreover, t-shirts and hats will be given respectively to discounted and full price-tickets customers. CREA will pay one week before the event both types of gadgets respectively paying them 5€ (t-shirts) and 15€ (hats). Moreover, for all the participants there will be the possibility to purchase a book about the history of the charity organization. The revenues of 20 € will be directly cashed-in by the charity organization that will take care for the books production costs of 10 €. CREA has to pay the security service for the night for a total of 5 000 €.

**Data interpolation is not requested. You can take the value that is closest to the one you desire.**

**Question 1)** **(2.5 points)** Define how many tickets to allocate for each customer segment (Protection Level).

**Question 2)** **(1.5 points)** Calculate the probability for CREA to reach a profit higher than 200.000 €.

**Question 3)** **(3 points)**

Close to the restaurant room there is a Bar to relax with family and friends after the dinner. Assume that the arrival rate of people at the bar equals 50 customers/hour.

There is one entrance for the bar and two servers available to welcome the customers based on a FIFO logic. On average they are able to serve 30 customers/h. Then, the 60% of people entering the bar move towards a room dedicated to families with kids (children room), the remaining people move to the CREA room. In each room there is a single server supporting the clients. Each host can serve 35 customers/hour.

Assume the arrival and the service rates follow a negative exponential distribution. Calculate the throughput time in minutes for the average number of people in the bar area.

Children room

Entrance (welcome)

CREA room

Figure 1: Queuing System