Assume that the time between arrivals of customers at a particular bank is exponentially distributed with a mean of 4 minutes.

(i) Find the probability that the time between arrivals is greater than 5 minutes.

(ii) Find the probability that the time between arrivals will be less than 1 minute.

## Question D11 - Exponential Distribution

Each 500-ft roll of sheet steel includes two flaws on average. What is the probability that as the sheet steel is unrolled the first flaw occurs within the first 50-ft segment?

- Average per 500-ft roll = 2.0
- average per 50-ft segment = 2.0/10 = 0.20
- $P(X \leq 50)$

$$= 1 - e^{-\lambda} = 1 - e^{-0.20}$$

= 1-0.81873 = 0.18127

## 0.1 Question D12 : Exponential Distribution

A machine is said to have a mean failure free lifetime of 2000 hours. What is the probability that the machine will last:

(i) at least 1000 hours

(ii) at least 1500 hours

(iii) less than 800 hours

(iv) less than 1800 hours

## 0.2 Question D13 - The Exponential Distribution - Example

The average lifespan ppf a laptop is 5 year. You may assume that the lifespan of laptop computers follows an exponential distribution.

- What is the probability that the lifespan of the laptop will be at least 6 years.
- What is the probability that the lifespan of the laptop will not exceed 4 years.
- What is the probability that the lifespan of the laptop will be between 5 years and 6 years.

## Question D14 - Exponential Distribution - Example

An average of five calls per hour are received by a machine repair department. Beginning the observation at any point in time, compute the following probabilites

(a) that the first call for service will arrive within ten minutes.

(b) that the first call for service will not arrive for 30 minutes.

- $\mu$ = Average per hour = 5.0
- $\lambda = \mu$ = Average per half hour = 2.5
- $P(X \leq 2.5)$

$$P(X \leq 2.5) = 1 - e^{-2.5} = 1 - 0.08208 = 0.91792$$

### 0.2.1 Question 3

(a) The period of pain relief reported by people treated with a drug is normally distributed with a Mean of 50 hours and a Standard Deviation of 16 hours. In a random sample of 64 people treated with the drug, what is the probability that the mean period of relief reported is between 48 and 53 hours? (2 marks)

## 0.3 Question D10 - Exponential Distribution

Faults occur in a fibre optic cable at the rate of 0.5 per 10KM of cable. Calculate the probability that:

(i) Exactly 2 flaws will occur in a given 10KM section

(ii) 4 or more flaws will occur in a given 10KM section

(iii) Eircom are providing 100KM fibre optic connection between Limerick and Cork. What is the probability of 7 or more flaws in the 100KM section?

(6 marks)