TD2 RMA

Exercise 1: What is the reliability of a device working for a period of time equal to the MTBF?

What is the failure rate when the time between two failures is infinite?

Exercise 2: A router operated for 8000 hours in continuous service with 5 failures with respective durations of: 7; 22; 8.5; 3.5 and 9 hours. Determine its MTBF. Determine λ if it is assumed to be constant. What is the reliability at between 0 and 2000h

Exercise 3: We study a network after 16500 hours. During this period, the network accumulated 218 stops. The data is summarized in the table below. We want to know the evolution of the reliability of the network and its usury phase depending on the shutdown intervals.

hours	MTBF	Failure rate
1000	66.7	
2000	100	
3000	250	
4000	500	
5000	400	
6000	555.6	
7000	416.7	
8000	526.32	
9000	500	
10000	476.2	
11000	555.6	
12000	512	
13000	200	
14000	111.1	
15000	100	

Exercise 4: Eight identical components tested over a period of 550 hours under the same conditions. The first component fails, irreparably, after 65 hours of operation, the second after 115 hours, the third after 135 hours, component four after 340 hours, component 5 after 535 hours, the other three components continue to operate normally .
What is the failure rate?

Exercise 5: Two inverters I1 and I2 have expo reliability laws with a failure rate lambda 1= 10^{-5} and lambda 2 =10^{-7} at a temperature of 18° F. It is assumed that the failure rate is multiplied by 10 for any increase temperature of 20° F for I1 and 10° F for I2. Knowing that the maximum temperature is 100°F for I1 and 120°F for I2. For what temperatures, inverter 1 has better reliability than I2.

Exercise 6: A Calculator can be seen as a repairable system. During a year, the calculator must be repaired 3 times. The first repair takes place after 98 days and lasts 10 hours, the second after another 100 days and lasts 9 hours, the third after another 105 days and lasts for 11 hours. Calculate the calculator's average repair time and repair rate, and the MTBF? What is the availability of the machine?

Exercise 7:

The maintenance manager of a company has the history file of equipment equipped with a production data. These data are summarized in the table below.

N°	Défaillance	Cause	TBF en h.	TTR en h.
1	Moteur	Electrique	80	2
2	Moteur	Electrique	40	3
3	Broche	Mécanique	50	2
4	Broche	Mécanique	100	8
5	Avance	Electrique	60	5
6	Avance	Electrique	40	2
7	Lubrification	Mécanique	20	3
8	Lubrification	Hydraulique	5	4
9	Lubrification	Hydraulique	10	3
10	Lubrification	Hydraulique	20	1.25

1. Calculate the total TBF.
2. Calculate the total TTR.
3. Calculate the MTBF.
4. Calculate the MTTR.
5. Calculate intrinsic availability.

Exercise 8:

A production system consists of 4 machines connected in series and whose failure rates, for 1,000 hours, are respectively: 0.052; 0.059; 0.044 and 0.048. What is the probability that the system will arrive without failure at 4000 hours. Determine the MTBF of the system?

Exercise 9:
A telephone system can be made in two series structures. The first includes 12 pieces of equipment with a failure rate of 10^{-7}, one with a rate of 10^{-6} and 3 with a rate of 10^{-5}. The second includes 4 pieces of equipment with a rate of 10^{-5}
Compare reliabilities.
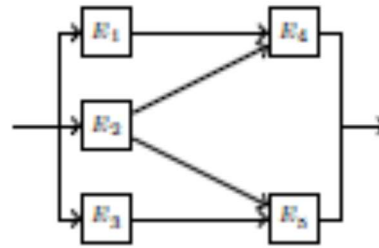
Exercise 10:

We wish to study the reliability of a VOIP system made up of 4 pieces of equipment on two modules interconnected according to various reliability diagrams
A1)Series, B1)parallel, a)series parallel and b)parallel series

1.   Determine for each case the exponential reliability, and the MTBFs
2.   What would this reliability as well as the MTBF be in the case of homogeneous equipment in terms of failure rates?

Values: lambda=10^{-4} failure/h and T=1 year

3.   Which of the organizations a or b has the better reliability in case of identical reliability?
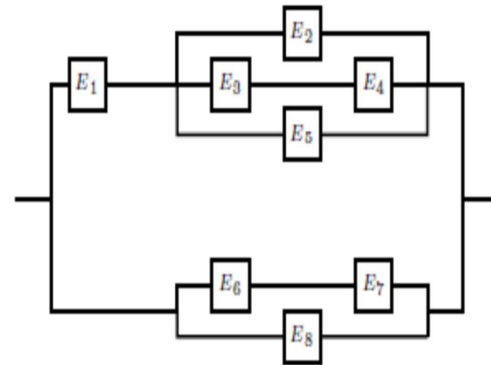
Exercise 11:

A travel agency's booking system consists of three PC connected in parallel. How reliable should each device be if we want to achieve an overall reliability of 0.999 (99.9%) for the entire system.

Exercise 12:
A component has a constant failure rate of 0.333 per 1000 hours of operation.
a) What is the probability that a component will survive after 3000 hours?

Exercise 13:

Give the reliability formula of these systems. Impair component have a reliability of 0.8 each while pair components have a reliability of 0.5 each

Exercise 14:
5 elevators are connected in parallel, two of which are necessary. The reliability of each is 0.75. How reliable is the entire system?

Exercise 15:
The car manufacturer estimates the reliability of its product to be 99% for the first 7 years.
a) How many cars will need to be repaired in the first year?
b) What is MTTF?

Exercise 16: A two-year warranty is given on a TV based on the assumption that no more than 3% of TVs will be returned for repair. Assuming exponential law, what is the maximum failure rate that can be tolerated?

Exercise 17: The manufacturer of a DVD player determines that the DVD player is used 930 hours/year on average. A two-year warranty is offered on DVD players with MTTF of 2500 hours. Assuming that the player can only fail if it is used, what is the rate of DVD players that will fail during the warranty period?