

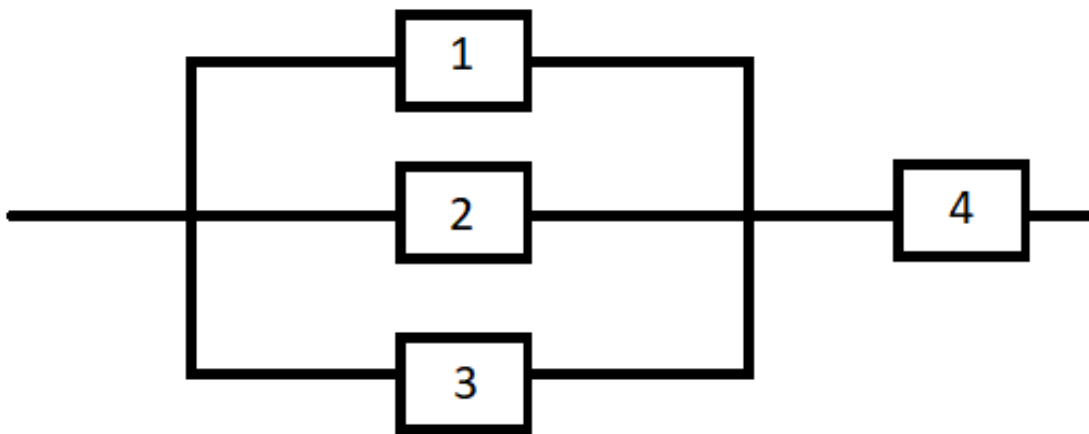
Portfolio week 10

1) Student Sam has access to two types of internet connection: a 4G phone connection, and a WiFi connection. The WiFi has unlimited data but is very unstable. The 4G connection is very stable but has limited data available. It is Friday night and Sam must submit an MZB126 assignment, there is a 90% chance that Sam will fail to submit their assignment if the WiFi isn't working and a 95% chance that Sam will fail to submit their assignment if the 4G service is out of data. Given that the probability of the WiFi not working 30% and the probability his 4G service is out of data is 25%:

a) What is the probability that Sam will have at least one way to submit their assignment, i.e. either the WiFi or the 4G connection will be working?

b) If Sam failed to submit an assignment, what is the probability that the WiFi connection was not working, given the probability of Sam not submitting an assignment is 0.38?

2) Calculate the probability that the following circuit fails to function if the probability that a component works is p and each component working is independent of the others.



3) A mechanical component's life expectancy is modelled by the pdf $f(t) = \frac{4}{t^5}$ for $t \geq 1$ and $f(t) = 0$ for $t < 1$.

a) What is the probability the machine will last at least 2 years before failing.

b) calculate the probability that a component's time to failure is between 1.2 and 1.8 years

b) Calculate the median life expectancy of the mechanical component. (The median life expectancy is when there is a 50% the component is still working and 50% chance it has failed).

c) Calculate the mean life expectancy and the variance of the life expectancy.

Portfolio week 11

After acing their MZB126 exams, Sam scored an internship, helping a company write a bid to expand the shoulder of the Dalby highway (a 300km section of road, stretching from Dalby to st George). Sam is to calculate several probabilities below. For each task, Sam must:

- i) identify the distribution,
- ii) calculate the parameters of the distribution,
- iii) calculate the probability by hand,
- iv) and then confirm the probability in MATLAB.

1) As part of expanding the highway, several mail boxes must be relocated. The local council has announced that one mail box can be expected every 25km. What is the probability that Sam observes 15 mail boxes while out counting them?

2) Fortunately, not all mail boxes have to be relocated. There is a 20% chance that the mail box is already far enough back from the road. To get a maximum possible cost, what is the probability all 15 mail boxes have to be relocated?

3) Data on the cost of relocating letter boxes on a previous job are listed in the data file attached. Given that the costs follow a normal distribution, calculate the probability that the cost/letter box on the current job will exceed \$100/letterbox.

Portfolio week 12

1) Write a .m file that accepts a vector of data, and calculates the sample mean and sample standard deviation.

2) Write a .m file that accepts a vector of data, and calculates a 95% CI of the mean of the data.

3) The data on the amount of what's produced at a small hydroplant are recorded in the csv file "hydro.csv" on blackboard.

a) A local community is concerned that not enough power is being produced from the plant. If the town requires 18 Megawatts to maintain its power supply, perform a hypothesis to determine the test statistic for $H_0 : \mu = 18$ Megawatts. Write a concluding statement regarding whether or not there is evidence to reject the hypothesis that the powerplant produces enough power.

b) compute a 95% confidence interval (either by hand or using your .m) of the average megawatts produced by the dam. State whether your confidence interval verifies the result of the hypothesis test from Q3a). Give reasoning as to how you came up with this statement.

Notes:

1i) you should have 1 vector as a input and two values as outputs (the sample mean and sample standard deviation).

1ii) you cannot use MATLABs inbuilt sum, mean or var functions, however you should use these to check your answers.

2i) your code should have 1 vector as an input, and 2 values as an output (a lower and upper bound).

2ii) you can use the mean and var functions of MATLAB.

3) use the data file to test your previous code!