

# Unit 12 - Week 10

## Course outline

How does an NPTEL online course work?

Week - 0

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Week 4

Week 5

Week 6

Week 7

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Week 9

Week 10

Lecture 46 : Design for Reliability-II

Lecture 47 : Design for Reliability-II (Contd.)

Lecture 48 : Design for Reliability-II (Contd.)

Lecture 49 : Design for Reliability-II (Contd.)

Lecture 50 : Design for Reliability-II (Contd.)

Week 10 : Lecture Material

Quiz : Assignment 10

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Week 11

Week 12

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## Assignment 10

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Due on 2020-04-08, 23:59 IST.

- 1) An electronic component in a video recorder has an exponential time-to-failure distribution. What is the minimum mean time to failure of the component if it is to have a probability of 0.92 of successful operation after 6000 hours of operation?

0 points

- a. 57972.209  
b. 47972.209  
c. 37972.209  
d. 27972.209

- ☐ a.  
☐ b.  
☐ c.  
☐ d.

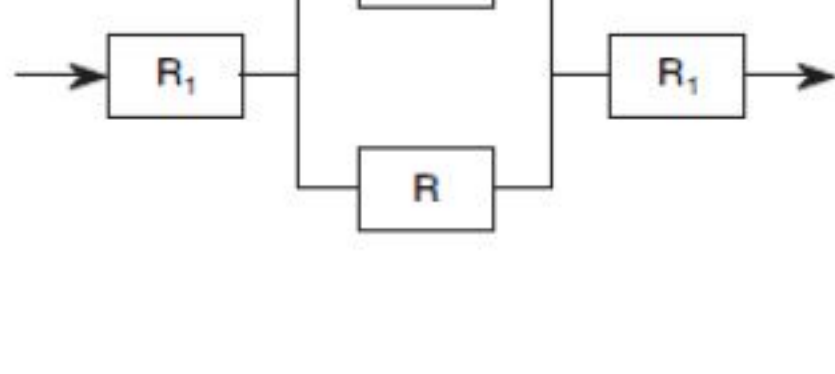
No, the answer is incorrect.  
Score: 0

Accepted Answers:

b.

- 2) Determine the system reliability if  $R = 0.90$  and  $R_I = 0.98$  for the system shown in the figure below.

2 points



- a. 0.6508  
b. 0.7508  
c. 0.8508  
d. 0.9508

- ☐ a.  
☐ b.  
☐ c.  
☐ d.

No, the answer is incorrect.  
Score: 0

Accepted Answers:

d.

- 3) A sample of 20 diodes is chosen for life testing. The time to failure of the diodes is exponentially distributed. The test is terminated after six failures, with no replacement of the failed items. The failure times (in hours), of the six diodes are 530, 590, 670, 700, 720, and 780. Estimate the mean time to failure of the diodes as well as the failure rate. Find a 95% confidence interval for the mean time.

2 points

- a. 2485 hours, 0.000402/hour,  $1277.635 < \theta < 6777.273$   
b. 3495 hours, 0.000202/hour,  $1557.241 < \theta < 9777.909$   
c. 2485 hours, 0.000202/hour,  $1277.635 < \theta < 6777.273$   
d. 3495 hours, 0.000402/hour,  $1557.241 < \theta < 9777.909$

- ☐ a.  
☐ b.  
☐ c.  
☐ d.

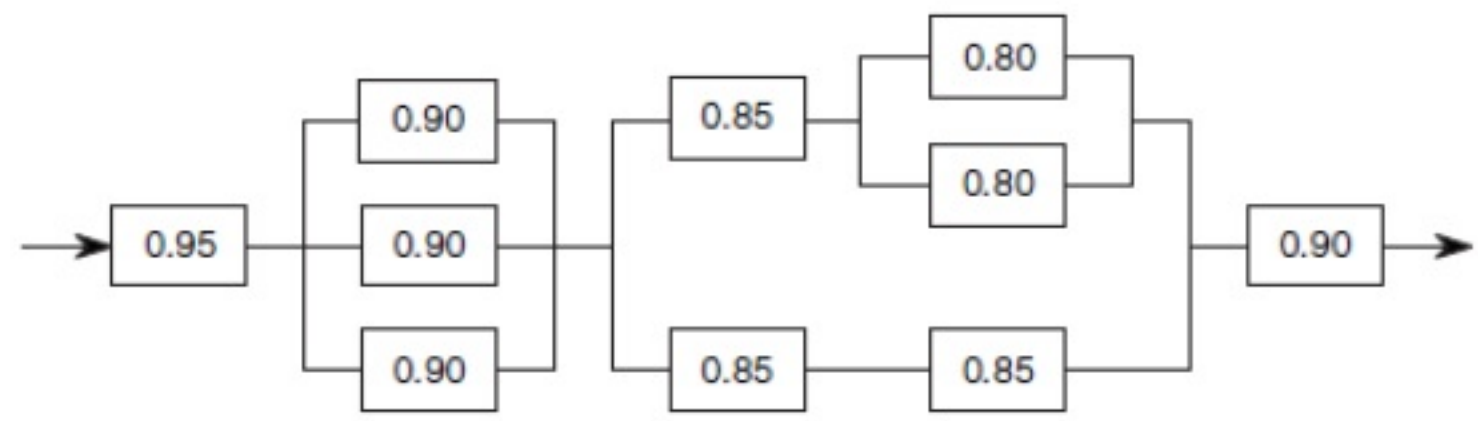
No, the answer is incorrect.  
Score: 0

Accepted Answers:

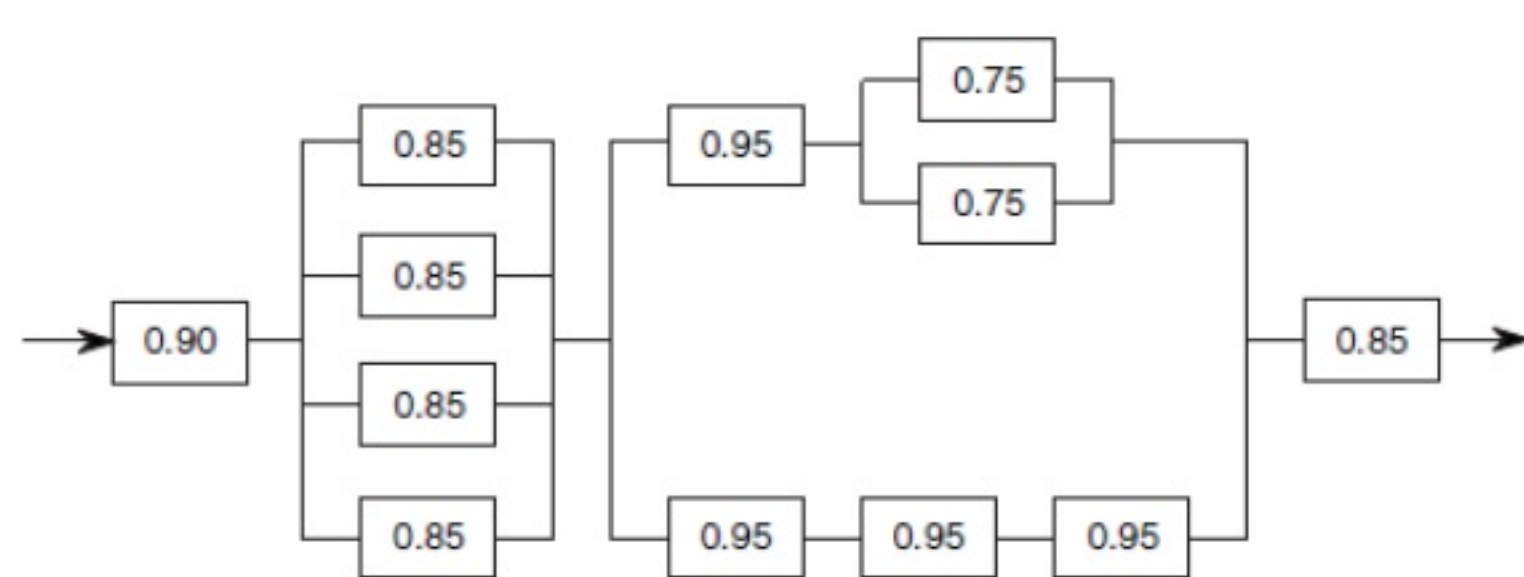
a.

- 4) Determine the system reliability of the series-parallel configurations shown in Figure (a) and (b) below

2 points



(a)



(b)

- a. 0.8306, 0.0791  
b. 0.6308, 0.0971  
c. 0.8306, 0.0971  
d. 0.6308, 0.0791

- ☐ a.  
☐ b.  
☐ c.  
☐ d.

No, the answer is incorrect.  
Score: 0

Accepted Answers:

c.

- 5) A system consists of a primary unit and a standby unit. The MTTF of the primary unit is 1200 operating hours, and the MTTF of the standby unit is 500 hours when in operation and 3000 hours while in standby status. Determine the system MTTF.

2 points

- a. 1337.81  
b. 1447.81  
c. 1557.81  
d. 1667.81

- ☐ a.  
☐ b.  
☐ c.  
☐ d.

No, the answer is incorrect.  
Score: 0

Accepted Answers:

c.

- 6) A complex electromechanical system has 800 components in series configuration. Extensive testing of 200 components revealed that 3 failures occurred after 2000 hours.

2 points

- a) Assuming a constant failure rate, determine the reliability of the system to operate for 2000 hours.  
b) If the desired overall system reliability is 0.99 in 2000 hours, determine the individual failure rate of the components.

- a.  $6.1442 \times 10^{-6}$ ,  $6.25 \times 10^{-9}$ /hour  
b.  $6.1442 \times 10^{-6}$ ,  $5.25 \times 10^{-9}$ /hour  
c.  $4.1442 \times 10^{-6}$ ,  $5.25 \times 10^{-9}$ /hour  
d.  $4.1442 \times 10^{-6}$ ,  $6.25 \times 10^{-9}$ /hour

- ☐ a.  
☐ b.  
☐ c.  
☐ d.

No, the answer is incorrect.  
Score: 0

Accepted Answers:

a.

- 7) The mean time to failure of a single unit and standby unit of a complex mechanical system are 50,000 hours and 30,000 hours respectively. Determine the mean time between failures of a single unit without standby that will have the same reliability as the standby system for the system to operate for 20,000 hours. Assume constant failure rate for the single unit.

2 points

- a. 101699 hours  
b. 201699 hours  
c. 301699 hours  
d. 401699 hours

- ☐ a.  
☐ b.  
☐ c.  
☐ d.

No, the answer is incorrect.  
Score: 0

Accepted Answers:

b.

- 8) a) Determine the reliability of the standby system with one basic component and two standby components. Each component has an exponential time-to-failure distribution. The failure rate of each component is 0.003/h and the period of operation is 400 h.  
b) Find the mean time to failure  
c) If the three components are arranged in parallel, find the reliability of the system.  
d) Find the mean time to failure for the parallel system in part (c).

2 points

- a. 0.879, 1000 hours, 0.859, 422.22 hours  
b. 0.879, 1000 hours, 0.659, 611.11 hours  
c. 0.789, 1000 hours, 0.659, 422.22 hours  
d. 0.789, 1000 hours, 0.859, 611.11 hours

- ☐ a.  
☐ b.  
☐ c.  
☐ d.

No, the answer is incorrect.  
Score: 0

Accepted Answers:

b.

- 9) The parameters of a life testing plan are as follows: time of test  $T = 800$  hours, sample size  $n = 12$  and acceptance number  $c = 2$ . Each item has an exponential time-to-failure distribution. When any item fails, it is immediately replaced by a similar item. Find the probabilities of acceptance for mean life of 1000, 10000 and 30000.

2 points

- a. 0.0042, 0.9268, 0.9952  
b. 0.9952, 0.9268, 0.0042  
c. 0.1446, 0.9060, 0.9872  
d. 0.9872, 0.9060, 0.1446

- ☐ a.  
☐ b.  
☐ c.  
☐ d.

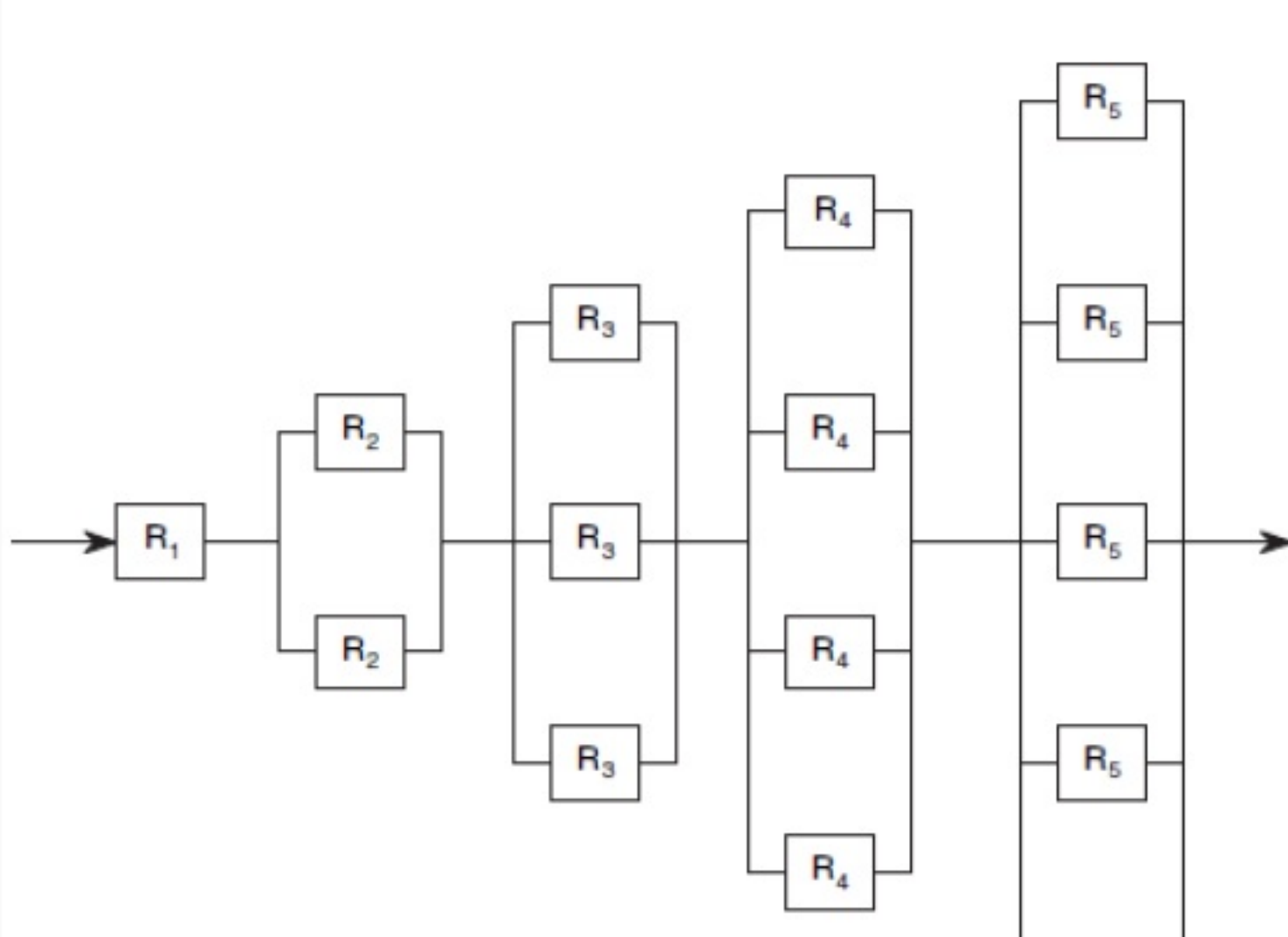
No, the answer is incorrect.  
Score: 0

Accepted Answers:

a.

- 10) Assuming an equal allocation to each redundant subset and each redundant subset contains identical components, find the component reliability of the system shown in figure below if the system reliability is 0.97.

2 points



- a. 0.986393, 0.82089, 0.717550, 0.620876, 0.539722  
b. 0.539722, 0.620876, 0.717550, 0.82089, 0.986393  
c. 0.639722, 0.720876, 0.817550, 0.922089, 0.99393  
d. 0.99393, 0.922089, 0.817550, 0.720876, 0.639722

- ☐ a.  
☐ b.  
☐ c.  
☐ d.

No, the answer is incorrect.  
Score: 0

Accepted Answers:

d.