

Roll No

ME-7004 (2) (CBGS)**B.E. VII Semester**

Examination, November 2019

Choice Based Grading System (CBGS)**Reliability Engineering***Time : Three Hours**Maximum Marks : 70*

- Note:** i) Attempt any five questions.
ii) All questions carry equal marks.
iii) Draw neat diagram wherever required.

1. a) Explain with examples random variables.
b) Explain about different types of reliability analysis methods.
2. a) Derive expression for mean and standard deviation of exponential distribution.
b) Derive the expression for reliability function $R(t)$ of a reliability system in terms of failure rate.
3. a) Three power supplies are configured in a standby redundant system with perfect switching. The failure rate for each of the power supplies is constant with a mean time between failures of 20,000 hours. What is the probability of the system failing in less than 1,00,000 hours?
b) A pump operates continuously with a mean time to fail of 200 hours that follows the exponential distribution. A second, identical pump is placed in standby redundancy, and the mean time to fail while the pump is inactive is 1,000 hours. The standby time to fail is also exponentially distributed. What is the mean time to fail for the system, and what is the system reliability at time = 300 hours?

4. a) Explain with examples, Probability density function and probability distribution function.
b) Justify the use of exponential distribution in reliability evaluation of non repairable system.
5. a) Explain the concept of Hazard rate with examples.
b) Derive the expression for reliability in terms of Hazard rate.
6. Consider a load-sharing system including two identical components. When both components are working, the hazard rate for individual components is 0.05 per year. However, when one component fails the work load is shifted to the remaining working component and the hazard rate increases to 0.15 per year. <http://www.rgpvonline.com>
a) Draw a state transition diagram for the system.
b) Derive the stochastic differential equation to model the reliability of each state.
c) Calculate the reliability function of each state.
d) Calculate the MTTF of the system.
7. a) Derive the expression for reliability evaluation of series and parallel systems.
b) Explain conditional probability method for reliability evaluation of non-series parallel systems.
8. Write short notes on
a) Laws of probability
b) Functions of random variables
c) Monte Carlo simulation.
