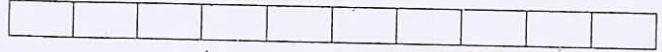


6/5/19



B.E. (FT) DEGREE END SEMESTER EXAMINATIONS, APRIL/MAY 2019

INDUSTRIAL ENGINEERING
IE 8603 RELIABILITY ENGINEERING
(R2012)

Time: 3 Hours

Max. Marks 100

Use of Statistical Tables is permitted.

Answer ALL questions.

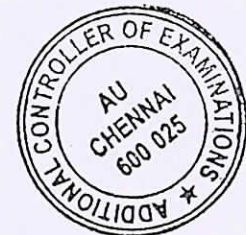
PART -A (10x2=20 Marks)

1. Indicate the differences between quality and reliability.
2. Define steady state availability.
3. State and define the parameters of reliability.
4. What are the methods of reliability improvement?
5. An equipment will fail only if all the three subsystems in the equipment would fail to operate. Construct a fault tree for the same.
6. Two units are backed by two spare units that are interchangeable. What is the probability that a spare unit is available when required, if the reliability of each unit is 0.85?
7. What do you mean by 'mortality' of a component'?
8. Prove that MTBF is the reciprocal of failure rate when the component is in the useful life period.
9. State the objectives of reliability growth monitoring.
10. What are the four input variables required to solve a Sequential life testing problem?

PART -B (5x16=80 Marks)

Question No. 11 is compulsory

11. A firm is considering replacement of an equipment whose first cost is Rs.1000 and the scrap value is negligible at any year. Based on the experience, it is found that the maintenance cost is zero during the first year and it increases by Rs.100 every year thereafter. When should the equipment be replaced?
- 12.a) i) A component can be repaired at the constant rate of 10 per 8 hour day. What is the probability of a single repair. (6 marks)
ii) A requirement exists for an engine fuel pump to be repaired within 3 hour 90 percent of the time. If the repair distribution is lognormal with shape parameter=0.45, what MTTR should be achieved to meet this goal?(10 marks)
(OR)
- b) Write short notes on:
 - i) Maintainability demonstration
 - ii) Reliability allocation
- 13.a) Demonstrate the application of Kolmogorov-Smirnov test to test the basic failure data for fitting into Poisson distribution.
(OR)



- b) Two hundred units were tested until all failed and failures were grouped into five time periods as shown below: Find out whether the failure data fit the exponential distribution or not.

Time interval (hr)	No. of observed failures
0-100	45
100-200	50
200-300	38
300-400	26
400-500	20

- 14.a) Derive the system reliability expression for two unit standby system.

(OR)

- b) Demonstrate the application of Cut and Tie sets method of predicting the reliability of complex configurations.
- 15.a) A system consists of ten components all connected in series. The predicted reliabilities as obtained from their respective failure data analysis are 0.995, 0.955, 0.988, 0.997, 0.994, 0.995, 0.996, 0.98, 0.998, 0.992. It is desired that the system reliability be 0.988. Determine the reliability goal of each component.

(OR)

- b) Illustrate the application of Duane reliability growth monitoring model with an example data.

