

END SEMESTER EXAMINATIONS, APRIL 2011
B.E. Industrial Engineering (VIII Semester)
IE482 RELIABILITY ENGINEERING

Duration: 3 hours

Max. marks = 100

(The use of Statistical Tables is permitted)

PART A (10x2=20 marks)

Answer all questions.

1. How would you graphically represent reliability?
2. What do you mean by a parallel redundant system?
3. What are the measures of central tendency of the failure distribution? Define each of them.
4. Define Mean Time To Restore.
5. Name the classifications of replacement models.
6. What are the methods of reliability improvement?
7. Distinguish between 'a priori' and 'a posteriori' probability of failure.
8. What is the purpose of reliability testing?
9. Indicate the application of Ebel and Lang graphs.
10. What are the factors that affect maintainability of a system?

PART B (5x16=80 marks)

Answer all questions.

11. Describe the application of Weibull distribution in reliability engineering with an illustration.
- 12.A. The following table gives the operation cost, maintenance cost and salvage value at the end of every year of a machine whose purchase value is Rs.19,000. Find the economic life of the machine assuming interest rate $i=0\%$.

End of year (n)	Operating cost at end of year	Maintenance cost at end of year	Salvage value at end of year
1	3000	300	9000
2	4000	400	8000
3	5000	500	7000
4	6000	600	6000
5	7000	700	5000
6	8000	800	4000
7	9000	900	3000
8	10000	1000	2000
9	11000	1100	1000
10	12000	1200	0

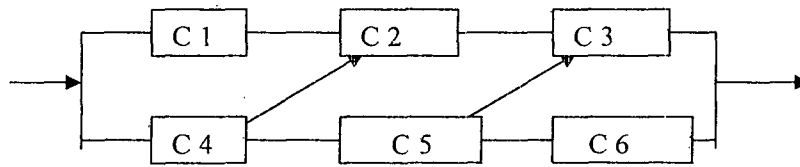
[OR]

- 12.B. Write short notes on:
 - i) Spare parts requirements for interchangeable spares
 - ii) Reliability growth monitoring

- 13.A For an emergency operation theatre in a hospital the power is obtained from the main city supply through a transformer connected in series. To ensure an uninterrupted supply an auxiliary generator is also used with a suitable switch over. The probability of failure of the city supply is 0.03 and the transformer reliability is 0.95. The auxiliary generator has a reliability factor of 0.90. Construct the fault tree and based on this calculate the reliability of the system.

[OR]

- 13.B. Using Baye's decomposition method derive the reliability of the system shown below taking C 4 as the pivot element. Also compute the reliability when all the elements have a reliability of 0.85.



- 14.A Explain the use of empirical methods of analyzing ungrouped complete data.

[OR]

- 14.B A test was conducted in a fixed population of 100 items over a 7 hour period and the frequency of failure is as given below.

Hours	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Failures	24	17	16	12	7	6	2

Determine the probability of survival and plot the survival curve.

- 15.A. The reliability of a complex system is $R(t) = [t^3/t_0]^2$ $0 \leq t \leq t_0$
Determine the failure rate.

[OR]

- 15.B. Discuss in detail the formulation of the inspection model to determine the optimal inspection frequency to maximize the expected profit.