Code No: RR411304 **Set No. 1**

IV B.Tech I Semester Regular Examinations, November 2005
RELIABILITY AND SAFETY ENGINEERING
(Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Calculate the MTTF of the component from the data of life testing of 50 specimen samples given below:

Time (in hour)	No. of Components working
0	50
2000	45
2040	40
2080	30
2120	20
2160	10
2200	0

(b) Define the reliability functions f(t), F(t), R(t) and h(t) and hence develop the relationship between them. [8+8]

2. (a) Estimate the reliability of the network shown in figure 1 below.

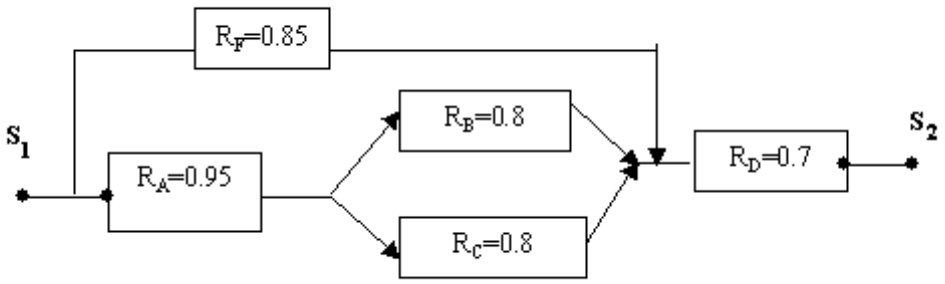

Figure 1:

(b) Describe the work study method of estimating MTTR (Mean Time to Repair) [8+8]

3. (a) Classify redundancy and discuss significance of each type.
(b) Discuss reliability calculation of K out of z systems. [8+8]

4. (a) Discuss critically concept of total productive maintenance.
(b) Define terotechnology and discuss their limitations and applications. [8+8]

5. (a) State the design considerations of maintainability. Explain how these aids are useful in maintainability and availability of a system.
   (b) Explain sequential reliability testing. Illustrate the concept with one example. [10+6]

6. (a) Discuss scope of life testing and its need for any new product.
   (b) Discuss the role of component reliability in design considerations for maintainability. [8+8]

7. (a) Explain the process of human reliability analysis.
   (b) Discuss how human reliability data is helpful in diagnosing human performance. [9+7]

8. (a) What are the general safety rules to be observed in an industry?
   (b) Define and explain product liability. [8+8]

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Code No: RR411304 **Set No. 2**

IV B.Tech I Semester Regular Examinations, November 2005
RELIABILITY AND SAFETY ENGINEERING
(Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) State the importance of quantitative techniques for reliability analysis of components and systems.
   (b) An electric motor consists of two parts, namely stator and rotor. They are manufactured in two different sections and then assembled together. The probability that a stator is defective is 0.06 and the probability that a rotor is defective is 0.09. What is the probability that an assembled motor will not be defective. [9+7]
2. (a) Describe weibull distribution
   (b) Prove that the hazard model of a system having m components in parallel and each component with a constant failure rate can be approximated to a weibull model. [8+8]
3. (a) Classify redundancy and discuss significance of each type.
   (b) Discuss reliability calculation of K out of z systems. [8+8]
4. (a) Discuss critically concept of total productive maintenance.
   (b) Define terotechnology and discuss their limitations and applications. [8+8]
5. (a) Discuss concept of maintainability demonstration and how does it helps reliability of machine.
   (b) Develop corrective maintenance time distributions to improve maintainability. [8+8]
6. (a) Define component reliability. Explain how component reliability can be imporved.
   (b) Write notes on MIL Standards. [9+7]
7. (a) What do you understand by Human reliability? Discuss the three main factors of human failure rates in a particular operation.
   (b) What is human reliability? Explain the various factors that influence human reliability. [8+8]
8. (a) What are the general safety rules to be observed in an industry?
   (b) Define and explain product liability. [8+8]

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Code No: RR411304 **Set No. 3**

IV B.Tech I Semester Regular Examinations, November 2005
RELIABILITY AND SAFETY ENGINEERING
(Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the following terms:
   i. Reliability
   ii. Availability
   iii. Maintainability
   iv. MTTF
   v. MTTR
   vi. MTBF
   vii. Frequency of failures
   viii. MTFF
   ix. MTT SF

   (b) An engine is to be designed to have a minimum reliability of 0.8 and minimum availability of 0.98 over a period of 2000 hrs. Determine the mean repair time and frequency of failure of the engine. [9+7]

2. (a) Explain briefly the following terms.
   i. Probability Density function f(t)
   ii. Hazard function h(t)

   (b) A component has a hazard function given by h(t) = (1+0.4t)×I0-3/hr. Calculate the reliability of the component for a mission time of 1 hour. [8+8]

3. (a) Explain how maintenance action helps to improve reliability.

   (b) Explain what is preventive maintenance? Hence develop the expressions for mean time to in service failure of n identical units in series and m identical units in parallel. [8+9]

4. (a) Explain in detail the design considerations of maintainability.

   (b) Derive the suitable relationships between reliability, maintainability and availability. [8+8]

5. (a) Discuss concept of maintainability demonstration and how does it helps reliability of machine.

   (b) Develop corrective maintenance time distributions to improve maintainability. [8+8]

6. (a) Discuss scope of life testing and its need for any new product.

(b) Discuss the role of component reliability in design considerations for maintainability. [8+8]

7. (a) Explain the process of human reliability analysis.

   (b) Discuss how human reliability data is helpful in diagnosing human performance. [9+7]

8. (a) Discuss the role of consumerism in global market and how to incorporate it in product development.

   (b) How does warranty differs from product liability. Discuss legal considerations in product liability. [8+8]

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Code No: RR411304 **Set No. 4**

IV B.Tech I Semester Regular Examinations, November 2005
RELIABILITY AND SAFETY ENGINEERING
(Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the following terms:
   i. Reliability
   ii. Availability
   iii. Maintainability
   iv. MTTF
   v. MTTR
   vi. MTBF
   vii. Frequency of failures
   viii. MTFF
   ix. MTT SF

   (b) An engine is to be designed to have a minimum reliability of 0.8 and minimum availability of 0.98 over a period of 2000 hrs. Determine the mean repair time and frequency of failure of the engine. [9+7]

2. (a) Describe k-out of m system and obtain expression for reliability

   (b) Explain the different hazard models. [8+8]

3. (a) What is condition monitoring? Briefly describe the effectiveness of different methods of condition based monitoring.

   (b) Explain sequential reliability testing. Illustrate the concept with a suitable example. [9+7]

4. (a) Outline the maintainability program elements with an example of maintainability tasks.

   (b) State the design aids for maintainability. Explain how these aids an useful in maintainability and availability of a system. [8+8]

5. (a) Explain preventive maintenance times

   (b) Describe
   i. Mean time between maintenance and
   ii. Mean time between replacement. [8+8]

6. (a) Discuss scope of life testing and its need for any new product.

   (b) Discuss the role of component reliability in design considerations for maintainability. [8+8]

7. (a) Discuss probable causes of failure and unreliability.
   (b) Discuss role of product knowledge in safety improvement. [8+8]
8. (a) What are the general safety rules to be observed in an industry?
   (b) Define and explain product liability. [8+8]

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