

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

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions  
 All Questions carry equal marks

\*\*\*\*\*

1. (a) Explain the following terms in connection with reliability evaluation. [2+3]
  - i. Independent events
  - ii. Mutually exclusier events.
- (b) A and B are two events associated with an experiment. If  $P(A)=0.4$  and  $P(A \cup B)=0.8$  determine  $P(B)$  such that. [2+3]
  - i. A & B are mutually exclusive
  - ii. A & B are independent.
- (c) A and B two events such that  $P(A)=x$ ;  $P(B)=y$  and  $P(A \cap B) = Z$ . Express the following in terms of x,y,z.  $\bar{A}$  is the complement of A. [3x2]
  - i.  $P(\bar{A} \cup B)$
  - ii.  $P(A \cup B)$
  - iii.  $P(\bar{A} \cap B)$
2. (a) State the conditions under which the Poisson Distribution can be applied. Derive the expression for the PDF of the Poisson distribution from that of the Bionomial distribution. [8]
- (b) Cable faults occur at an averagge rate of 1 fault per year per km. Calculate the probability of having amonth in which there is no fault on a 6 km cable. [8]
3. (a) Explain the construction of a reliability block diagram. [8]
- (b) The reliability block diagram of system is shown in Figure 1. The figures on the components represent their reliabilities for a mission time of 100 hours. Calculate the reliability of the system. [8]
4. (a) Define the term 'Maintainability' as applied to a repairable component. [8]
- (b) Distinguish between 'Preventive maintenance' and 'Corrective maintenance' and explain how they affect the probability and frrequency of failure. [8]
5. (a) Explain what is meant by Reliability testing. Enumerate the types of tests used to evaluate a design. [8]
- (b) Assume that 100 components are placed on test for 1000 hours. From previous testing it is believed that the hazard rate is constant and the MITF=500 hours. Estimate the number of components their will fail in the time interval of 100 hours to 200 hours. [8]

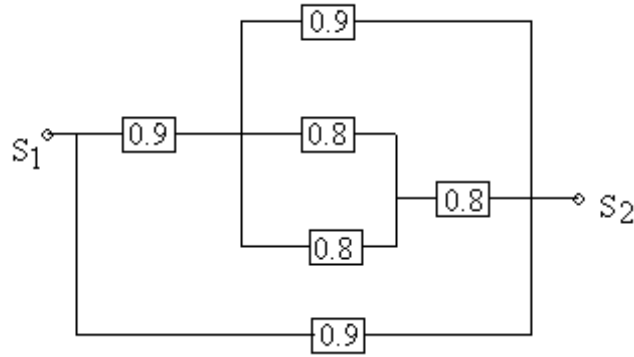


Figure 1:

6. (a) What do you understand by human reliability? Discuss the main three factors of human failure rates in a particular operation. [8]  
(b) Discuss how human reliability data is helpful in diagnosing human performance. [8]
7. (a) Explain what you understand by the term terotechnology and derive one of its typical contributions. [8]  
(b) Outline the scope and interrelations of terotechnology. [8]
8. Write brief notes on the following:
  - (a) Markov model of a component with repair and maintenance. [6]
  - (b) The weibull distribution. [5]
  - (c) Accelerated life testing. [5]

\*\*\*\*\*