

Roll No .....

**MMCM - 301(C)****M.E./M.Tech., III Semester**

Examination, June 2016

**Reliability and Total Productive Maintenance***Time : Three Hours**Maximum Marks: 70***Note:** Attempt any five questions. All questions carry equal marks.

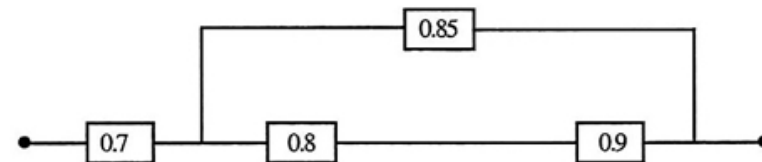
1. A new fuel injection system is experiencing high failure rates the reliability function has been found to be

$$R(t) = (t+1)^{-3/2} \quad t \geq 0$$

where  $t$  is measured in years. The reliability over its intended life of 2 years is 0.19, which is unacceptable. Will a burn in period of 6 months significantly improve upon this reliability? If so, by how much? 14

2. a) Define the concept of Availability? Enlist its types. 7  
 b) A washing machine reported 6 failures during a period of 1500 hours of operation. The average repair time per failures is 1 hour. Determine the failure rate  $\lambda$ , MTTF and MTBF. 7
3. The life (hours) of a component is modeled using lognormal distribution. The two parameters for the distribution are given as mean ( $\mu = 5.5$ ) and standard deviation ( $\delta = 1.6$ ). Determine the reliability of the component at 1,000 hours and its MTTF. 14

4. A personal computer system consists of the components, the processor unit, the monitor, the mouse, and the keyboard. All components must operate for the system success. The expected failures per million hour for the components are 120 for the processor unit, 200 for the monitor, 150 for the mouse, and 180 for the key board. Determine the system reliability for a mission time of 500 hours. 14
5. a) What is reliability block diagram? Explain series systems and parallel systems. 7  
 b) A mechanical system consists of the 4 components shown is figure. The component reliabilities are given in the block. Find the system reliability. 7



6. A system has three identical components two of which must operate for system success. The third component is a stand by unit. If each component has a failure rate of 0.0006/hour, find the system reliability for a mission time of 400 hours. Assume perfect sensing and switching? 14
7. a) What are the objectives of risk assessment and management? 7  
 b) Compare the "fault tree analysis" and "failure mode and effect analysis" (FMEA)? 7
8. a) Explain the TPM methodology of working. 7  
 b) Describe various methods used for reliability testing. Why their planning is required? 7

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