8E4052

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# 8E4052

**B. Tech. (Sem. VIII) (Main) Examination, May/June - 2010**
**Mechanical Engg.**
**(8ME4.1 (Elective-II) Reliability & Maintenance Engg.)**

Time : 3 Hours] [Total Marks : 80
[Min. Passing Marks : 24

*Attempt any five questions selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.) Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination.

*(Mentioned in form No. 205)*

1. Nil 2. Nil

## UNIT - I

1 (a) Define maintenance. Discuss the objectives and functions of the maintenance. 8

(b) A company maintains a fleet of cars. The initial cost of a car is Rs. 3,50,000/-. The rate of increase in operation and maintenance costs are Rs. 10,000/- and Rs. 4,000/- respectively. The costs of operation and maintenance for the first year of service are Rs. 60,000/- and Rs. 6,000/- respectively. Find the optimum time between replacements and minimum average cost. 8

OR

2 (a) What are the basic components of a maintenance organization? Explain the factors that will decide the maintenance organization of a plant. Suggest a suitable structure for the maintenance department of a big plant. 8

(b) Explain the working planned maintenance system. What are the minimum documents required to operate such a system? Suggest a suitable work order format. 8

## UNIT - II

3 Out of preventive periodic and preventive predictive maintenance strategies, which one will you prefer and why? Give the steps, in which preventive predictive maintenance could be implemented? 16

**OR**

4 Explain the following :
(i) Computerized maintenance
(ii) Total productive maintenance. 16

## UNIT - III

5 (a) Define the following :
(i) Reliability
(ii) MTTF
(iii) MTBF. 8

(b) The reliability of a cutting assembly is given by

$$R(t) = \begin{cases} \left(t - t/t_0\right)^2 & 0 \le t \le t_0 \\ 0 & t > t_0 \end{cases}$$

Determine :
(i) the failure rate
(ii) does failure rate inreases or decreases with time
(iii) determine the MTTF. 8

**OR**

6 (a) What is bath tub curve? What useful information can be obtained from it? 8

(b) The probability density function is given by

$$f(t) = \begin{cases} 0.002\, e^{-0.002\,t} & t \ge 0 \\ 0 & \textit{otherwise} \end{cases}$$

Determine R(t) and MTTF. 8

## UNIT - IV

7 A radio set consists of three major components a power supply, a receiver, and an amplifier, having reliabilities 0.8, 0.9 and 0.85 respectively. Compute system reliabilities for both low level and high-level redundancy for the system with parallel components. Show the systems by block diagrams. **16**

**OR**

8 Consider two identical independent units with failure rate of 0.01/Hr and mission time of 32 hours. Compare the reliability of a system made of these units if they are placed in

(i) Series configuration
(ii) Parallel configuration
(iii) Standby configuration with perfect switching
(iv) Standby configuration with imperfect switching and standby failure rate of 0.000001/Hr for sensing and switching device and 0.00001/Hr for standby unit. **16**

## UNIT - V

9 (a) Highlight the importance of spare parts provisioning in maintenance organizations. Discuss the classification of stores based on the need of the organization. **8**

(b) Explain how spare parts cost can be optimized. **8**

**OR**

10 Write short notes on any three of the following spare parts control approaches :

(i) ABC analysis
(ii) FSN analysis
(iii) XYZ analysis
(iv) VED analysis. **16**