8E4052

Roll No. _____ Total No of Pages: 4

8E4052

B. Tech. VIII Sem. (Main/Back) Exam., April, 2015

Mechanical Engineering

8ME4.1 Reliability and Maintenance Engineering

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:

*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.

1. NIL 2. NIL

UNIT – I

Q.1 (a) Highlight various causes of equipment breakdown and elaborate possible ways to overcome. [8]

(b) Discuss economies of maintenance function for productive system. [8]

OR

Q.1 Compare -

(a) Breakdown maintenance and Time-based maintenance. [8]

(b) Age replacement and Periodic replacement policy. [8]

UNIT – II

Q.2 (a) Justify the significance of Non-destructive testing with-respect-to conventional testing methods. [8]

(b) Explain oil analysis and radiographic testing methods. [8]

OR

Q.2 Suppose you are in-charge of maintenance department in XYZ manufacturing firm. Your boss asked you to submit report on maintenance policy that the firm should adopt and follow. Write the report, it should include everything like mission, vision, objective, methodology etc. [16]

UNIT – III

Q.3 (a) The reliability of a cutting assembly is given by - [8]

$$R(t) = \begin{cases} (t - \frac{t}{to}), & 0 \le t \le to \\ 0, & t \ge to \end{cases}$$

Determine -

(i) The failure rate

(ii) Does failure rate increase or decrease with time

(iii) Determine the MTTF

(b) A linear hazard function $\lambda(t) = 5 \times 10^{-6} t$, where 't' is measured in operating hours. If the reliability of 0.98 is desired, what is the design life? [8]

OR

Q.3 (a) A particular machine has a constant failure rate of $\lambda = 0.02$ hrs. [8]

(i) What is the probability that it will fail within first 10 hours

(ii) Suppose that the machine has successfully operated for 100 hrs, what is the probability that it will fail during the next 10 hours of operation.

(b) A device has a decreasing failure rate characterized by two parameter Weibull distribution with a wear out linear hazard function [8]

$$\lambda(t)=\frac{2}{1000}\left(\frac{t}{1000}\right)=2\times10^{-6}t$$

The shape parameter β =2 and scale parameter, θ = 1000. The device is required to have a design life reliability of 0.99. Determine the design life and MTTF.

UNIT – IV

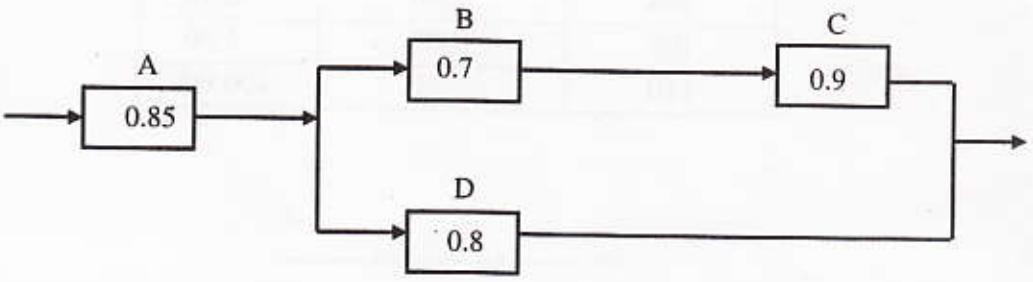
Q.4 (a) A system is composed of 10 components connected in series. Each component has an exponential time to failure distribution with a constant failure rate of 0.5 per 4000 hours. Compute the reliability of the system for 2000 hours of operation and find MTTF. [8]

(b) (i) Elaborate various configurations of system reliability. [4]

(ii) What do you mean by redundancy? Explain with an example. [4]

OR

Q.4 (a) Calculate the system reliability for units connected as shown below: [8]



(b) (i) Explain the concept and use of pareto analysis [4]

(ii) How reliability of a product could be enhanced? [4]

UNIT – V

Q.5 As an engineer of NST manufacturing firm, prepare a detailed report to be submitted to boss of the firm regarding your plan for spare part management (including objectives, features, methodology etc.) that aid in smooth working of firm. [16]

OR

Q.5 (a) (i) Compare ABC analysis and XYZ analysis. [4]

(ii) Give example of VED analysis [4]

(b) Ten items are kept in the inventory. The details regarding the number of items used per annum and price per unit are given below. Classify the items into A, B and C class. [8]

Item No.	Annual Usage	Price
101	200	40.00
102	100	360.00
103	2000	0.20
104	400	20.00
105	6000	0.04
106	1200	0.80
107	120	100.00
108	2000	0.70
109	1000	1.00
110	80	400.00

----------x----------x----------