MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : ME-703A

MAINTENANCE ENGINEERING

Time Allotted : 3 Hours | *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

i) Availability is the ratio of
   a) MTTR/(MTTR + MTBF)
   b) MTBF/(MTBF-MTTR)
   c) MUT/(MUT+MDT)
   d) MUT/(MUT+MCT+MLDT).

ii) Breakdown maintenance applicable where
   a) No. of equipment are few
   b) No. of equipment are more
   c) To eliminate/reduce repetitive breakdowns
   d) Minor repair.

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iii) Operational availability is expressed interms
   a) MTBM/(MTBM+MDT)
   b) MDT×MTBM
   c) (MDT-MTBM)/MDT
   d) MTBF/(MTBF+MTTR).

iv) Predictive maintenance refers
   a) Routine to repair or replace on fixed frequency
   b) Reacting to present condition and fix
   c) Team oriented continuous improvement
   d) Utilization of predictive techniques like reliability-centered maintenance.

v) Ultrasonic method is used for
   a) detect leaks and corrosion level
   b) oil and lubricant monitoring
   c) alignment checking
   d) vibration measurement.

vi) Due to presence of foreign element in the lubricant, gear teeth may fail due to
   a) Abrasive wear b) Corrosive wear
   c) Initial Pitting d) Scoring.

vii) Failure Rate (FR) represents
   a) Maintainability b) Reliability
   c) Availability d) All of these.

viii) Life cycle costing (LCC) is
   a) cost of maintenance
   b) operating cost of the machine
   c) calculating total ownership cost over the entire lifespan of the machine
   d) none of these.

ix) Effective utilization of machine idle time is an essential feature of

a) Breakdown Maintenance
b) Scheduled Maintenance
c) Total Productive Maintenance
d) Preventive Maintenance.

x) If MTTF is 98 hours and MTTR is 2 hours and the machine works for 350 days a year × 24 hours basis, what is the inherent availability ?

a) 96% b) 343 days
c) 98% d) 358 days.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Classify different types of Maintenance system as commonly practiced in the field of engineering.

3. Draw the Bath Tub Curve. Using it explain different phases of failure. 2 + 3

4. Briefly explain the ABC and VED analysis, as applied to control inventory. $2 \times 2\frac{1}{2}$

5. Name different types of lubricants ? What are the important properties of lubricants ? Explain. 1 + 4

6. A 100-h life test is performed on 10 components. One component failed after 400 h, another failed after 620 h and still another one failed after 780 h. The rest survived the test. Compute the failure rate for the case of no replacement.

7. What are the measures to improve equipment effectiveness ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

8. a) What is the main objective of planned maintenance ? What are the concepts included in planned maintenance ? Briefly explain that.
   b) Explain the stages for implementing TPM in an industry.
   c) What are the benefits of TPM ? 5 + 7 + 3

9. a) Explain how maintenance audit helps in improving the production of any organization.
   b) Discuss the factor which influence manpower planning for maintenance work. 6 + 9

10. A set of 1000 valves were put to operation simultaneously. The report of failed data is given below :

Operating time (hrs)	0	100	200	300	400	500	600	700	800	900	1000
Number of surviving components	1000	895	810	730	660	600	545	495	450	410	373

Calculate the hazard rate and failure rate.

11. Write short notes on any *three* of the following : 3 × 5
    a) Repair of damaged gear
    b) Maintenance audit
    c) Repair of crack on a machine bed
    d) Visual testing method
    e) Vibration monitoring instrument in maintenance.

12. a) What factors are required to be considered while preparing a maintenance budget ?
    b) State the advantages of Life-cycle costing.