

MAINTENANCE ENGINEERING
(MECH 4141)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

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

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) The first step in repairing crack is to make two drills at the two ends of the crack. This is done to
(a) stop further propagation (b) facilitate welding
(c) mark edges (d) check crack depth.
- (ii) The best method of lubrication of high speed anti friction bearing is
(a) grease packing (b) forced oil
(c) oil mist (d) cold air.
- (iii) Maintenance which is done to keep the facilities in efficient condition is called
(a) running maintenance (b) breakdown maintenance
(c) preventive maintenance (d) corrective maintenance.
- (iv) Periodic checking of engine oil viscosity is a part of
(a) running maintenance (b) preventive maintenance
(c) breakdown maintenance (d) corrective maintenance.
- (v) Babbitt is used as a plain bearing material because of its
(a) conformability (b) corrosion resistance
(c) yield strength (d) temperature strength.
- (vi) The important property of lubricant relevant to cold countries is
(a) lubricity (b) viscosity
(c) calorific value (d) cloud point and pour point.
- (vii) Of the following items identify the perishable item in a maintenance store.
(a) M8 x 25 HX. HD Bolt (b) Stoving Paint
(c) Foundation bolt (d) Chain pulley block
- (viii) MTBF stands for
(a) mean time between faults (b) machining time before failures
(c) mean time between failures (d) none of these.

- (ix) During installation, a machine is put on packing plates placed on foundation surface to allow
- (a) pouring of concrete

(b) foundation bolt location

(c) machine levelling

(d) foundation bolt tightening.
- (x) Identification of Vital Few and Trivial Many is the outcome of
- (a) Six sigma

(b) Taguchi method

(c) PDCA

(d) Pareto analysis.

Group – B

2. (a) Define the following terms:
- (i) Condition based maintenance

(ii) Reliability centred maintenance.
- [[CO1](Remember/LOCQ)]
- (b) In a life test on a sample of 20 electric bulbs, they failed at the following test hours. Determine the MTTF of these bulbs.

840	1060	1200	1296	1362
861	1100	1225	1314	1389
901	1137	1251	1331	1401
993	1184	1270	1348	939

[[CO1](Evaluate/HOCQ)]
6 + 6 = 12

3. (a) What are the components of Overall Equipment Effectiveness ? Which component of the OEE is maintenance department directly responsible for? [[CO2](Analyse/IOCQ)]
- (b) An equipment is scheduled to run for an 8 hr. shift with 30 minutes scheduled break and on a particular shift it was not in operation for 60 mins due to unscheduled maintenance. The standard rate of production is 40 units/hr. But that particular shift produced 240 units. 30 units were found defective out of 240 units produced. Calculate OEE.

[[CO2](Evaluate/HOCQ)]
6 + 6 = 12

Group – C

4. (a) What are the objectives of the maintenance department ? What are the factors on which the position of maintenance department is decided in organisation chart?
- [[CO3](Understand/LOCQ)]
- (b) What is maintenance scheduling? What are the benefits of a planned maintenance Job?
- [[CO3](Evaluate/HOCQ)]
- 6 + 6 = 12
5. (a) What are the components of maintenance cost? How are maintenance costs estimated?
- [[CO4](Analyse/IOCQ)]
- (b) How does maintenance audit help an organization? Describe the process of maintenance audit in an organization.
- [[CO5](Analyse/IOCQ)]

6 + 6 = 12

Group – D

6. (a) Explain different types of painting processes that may be applied on a MS sheet metal surfaces. What are the advantages of powder coating over liquid painting?

[(CO5)(Understand/LOCQ)]

(b) Briefly describe the process of identification of sub-surface crack detection using magnetic particle inspection method.

[(CO6)(Analyze/IOCQ)]

6 + 6 = 12
7. (a) Name different types of manual and automatic lubrication system that are used in industries.

[(CO5)(Remember/LOCQ)]

(b) What are the functions of seals and packings? Describe the radial shaft seals and O rings used to prevent leakage of oil.

[(CO5)(Remember/LOCQ)]

6 + 6 = 12

Group – E

8. (a) How is a worn shaft repaired?

[(CO6)(Understand/LOCQ)]

(b) Discuss the different methods of mounting rolling element bearings.

[(CO6)(Understand/LOCQ)]

6 + 6 = 12
9. (a) Briefly describe how gear boxes are assessed for wear and what are the maintenance actions one must take to restore to near normalcy.

[(CO6)(Remember/LOCQ)]

(b) What may be the causes of centrifugal pump delivery stoppage?

[(CO6)(Remember/LOCQ)]

6 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	56.25	25	18.75

Course Outcome (CO):

After the completion of the course students will be able to

- CO1 Identify the difference between repair and maintenance, their types and applications
- CO2 Implement TPM in an organization and evaluate overall equipment effectiveness
- CO3 Design a Maintenance organization and workout maintenance and resource planning
- CO4 Evaluate maintenance cost and prepare maintenance budget
- CO5 Select suitable maintenance tools and tackles and preferred lubrication system
- CO6 Apply appropriate maintenance procedures with suitable tools and equipment.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.

