

THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
MASTER OF TECHNOLOGY IN INDUSTRIAL ENGINEERING – LEVEL 7
FINAL EXAMINATION – 2010/2011
MEX 7119 – MAINTENANCE MANAGEMENT



DATE : 20 March 2011

TIME : 0930 hrs – 1230 hrs

DURATION : Three (03) hours

Answer any five (05) questions. All questions carry equal marks.

- 1
 - (i) Traditionally the maintenance has been considered as a necessary evil and always having problems in carrying out. Discuss your experience with suitable examples.
 - (ii) Suggest suitable methods to overcome this situation in order to implement your maintenance program as scheduled.
 - (iii) One important aspect that you have to consider as Maintenance Manager is to achieve quality of maintenance. Discuss the areas that you have to consider to achieve this quality goals.

- 2
 - (i) What do you mean by maintenance philosophy?
 - (ii) Discuss the factors that influence the maintenance load forecasting.
 - (iii) Discuss the maintenance capacity planning and its importance to have an effective maintenance management system.
 - (iv) Scheduling of maintenance activities is an important factor which influences the successfulness of the implementation. Do you agree? Justify your answer.

- 3
 - (i) Discuss with suitable examples how the reliability affects Performances, Cost, Quality and Safety.
 - (ii) Find the reliability of a system which consists of 05 components connected in series and having reliabilities of 0.8, 0.75, 0.6, 0.95 and 0.97. If the desired reliability of the system is 0.6, find which component should be improved and by how much?

- (iii) A system consists of three components A, B and C connected in series with reliabilities of 0.7, 0.8 and 0.9 respectively. The cost of failure of the system is Rs.100, 000.00. It is decided to improve the reliability of the system by adding a component A parallel to the original system. If the cost of A is Rs. 10,000.00, find the number of components of A required to minimize the cost.
- 4 (i) What do you mean by lean maintenance?
- (ii) Discuss the difference between the Strategic Assets Management and traditional maintenance improvement efforts.
- (iii) Describe the importance of properly defined Metrics in Maintenance Management.
- (iv) Benchmarking is an important tool that the maintenance manager can use in improving the effectiveness of the entire maintenance management process. Do you agree? Justify your answer.
- 5 (i) Why preventive maintenance is a preferred approach relative to breakdown maintenance? Justify your answer with suitable examples.
- (ii) The important aspect of the preventive maintenance is to minimize the overall cost of the production / operation process. Do you agree? Justify your answer.
- (iii) Preventive maintenance program does include risk. Do you agree? Justify your answer.
- (iv) Preparation for preventive maintenance is vital in executing the program successfully. Suggest basic steps that you have to take in the preparation stage of preventive maintenance.
- 6 (i) Discuss the factors that should be considered in deciding outsourcing of maintenance and the methods that have to be implemented to overcome the problems associated with outsourcing.
- (ii) A system is a set of mutually related items brought together in order to perform a well defined function.
Name such a system well known to you.

Discuss factors that influence the technical effectiveness of the systems described above. Describe the factors required to improve the systems operational effectiveness.

7. (i) Discuss the major component of the Life Cycle Cost of your assets.
- (ii) How maintainability of your assets influence the Life Cycle Cost?
- (iii) The workshop double cab which was purchased five years back is having some engine problems. The estimated cost of overhauling the engine is Rs. 40,000.00 to get an extended life of 6 years. The operational and maintenance cost of the cab with the overhauled engine is Rs. 40,000.00 per annum. However the reconditioned engines are available in the local market at a total cost of 100,000.00 with 10 years life span. The annual operational and maintenance cost of the cab with a reconditioned engine is Rs. 20,000.00. The old engine is having a scrap value of Rs. 12,000.00. The cost of capital is 20% and the capital recovery factor is given by $i(1+i)^n / [(1+i)^n - 1]$.

Please advise your management on the available options with reasons.

8. (i) Discuss the major factors that reflect the quality of your maintenance process.
- (ii) A garment manufacturing company operates 260 days per annum on two shifts. Each shift covers 08 hours to produce Rs. 500,000.00 worth of items per day. During the last year factory was able to operate only 200 days. According to the maintenance manager, entire plant was stopped 160 hrs due to major breakdowns in addition to the 100 hrs stoppages due to planned maintenance. Production had to slow down by 80% process rate for 320 hrs due to labour unrest during the year. Poor quality of raw material affected the process rate by 60% for 160 hrs during the year. The total value of the rejected garments during the year was Rs. 2million. You are required to calculate the following:
- Utilization of the facility
 - Availability of the facility
 - Process rate
 - Quality rate
 - Overall Equipment Effectiveness