BME-025

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

June, 2011

BME-025 : CONDITION MONITORING AND MAINTENANCE ENGINEERING

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **any seven** questions. Use of calculator is permitted.*

1. (a) What do you understand by the term 'Maintenance Planning' ? What are different phases involved in Maintenance Planning ? **2x5=10**

   (b) Distinguish between the Centralized and Decentralized systems of plant engineering.

2. (a) When does an organisation opt for contractual maintenance ? Explain with examples. What are its merits and demerits ? **2x5=10**

   (b) "Prevention is better than cure". How do you support with reference to the plant engineering functions ?

3. (a) Discuss F - S - N Analysis in detail with reference to the application to maintenance of spare parts. **2x5=1**

(b) The process times and due dates for five jobs A, B, C, D, and E are given in the table below :

Job	Process time (Days)	Due date (Days From Now)
A	9	16
B	7	20
C	5	25
D	11	15
E	6	40

The jobs may be sequenced according to any of the following rules :

(i) Shortest Processing Time (SPT)

(ii) Earliest Due Date (EDD)

For the above set of jobs, compute the following characteristics for sequencing by both the priority rules (sequencing rules) :

(i) Total completion time

(ii) Average flow time

(iii) Average number of jobs in the system

(iv) Average job lateness.

4. (a) What are the reasons for the successful application of robots in manufacturing industries ? Give suitable examples. **2x5=1**

(b) A firm with a processing system using machines X and Y in sequence has now installed another machine, Z which performs an equivalent job. If the respective reliabilities of X, Y and Z are 0.9, 0.8 and 0.7 respectively as shown in figure 1, what is the total reliability of the system ?

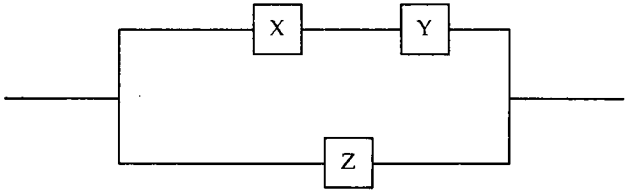

Figure - 1

5. (a) A metals processing firm wishes to install enough automatic moulders to produce 250,000 good castings per year. The moulding operation takes 1.5 minutes per casting, but its output is typically about 3 percent defective. How many moulders will be required if each one is available for 2,000 hours (of capacity) per year ? **2x5=10**

(b) There are seven jobs that must be processed in two operations : A and B. All seven jobs must go through A and B in the sequence - A first, then B. Determine the optimal order in which the jobs should be sequenced through the process using these times :

Job	Process A Time	Process B Time
1	9	6
2	8	5
3	7	7
4	6	3
5	1	2
6	2	6
7	4	7

(a) Describe in brief the following : 2x5=10

(i) Wear debries monitoring, and

(ii) Corrosion monitoring

(b) What do you understand by data in consistencies ? Give some examples.

(a) A truck owner finds his past experience that the maintenance costs are Rs. 200 for the first year and then increase by Rs. 2000 every year. The cost of truck type A is Rs. 9000. Determine the best age at which to replace the truck. If the optimum replacement is followed what will be the average yearly cost of owning and operating the truck ? Truck type B costs Rs. 20,000. Annual operating costs are Rs. 400 for the first year and then increase by Rs. 800 every year. The truck owner has now the truck type A which is one year old. Should it be replaced by B type, and if so, when ? 2x5=10

(b) Find the cost per period of individual replacement policy of an installation of 300 bulbs given in the following :

(i) Cost of replacing individual bulb is Rs. 3/-

(ii) Conditional probability of failure is given below.

Week No.	0	1	2	3	4
Conditional Probability of failing	0	1/10	1/3	2/3	1

8. (a) What do you understand by the term "Modularisation" (or modular design) ? List out its advantages. 2x5

(b) In a reliability analysis, it is found that the data is fit in 2-parameter Weibull distribution with the shape parameters as 1.5 and scale parameter as 5. Design the reliability in terms of characteristic life, optimal life, B1 life, T (median) and T (mode).

9. (a) The reliability of a system is estimated at 0.75. On application of condition monitoring techniques the reliability of a system is found to be improved to 0.95. Find reliability improvement factor (RIF). 2x5=1

(b) A complex electronic system consisting of electronic gadgets has MTBF 120 hours and MTTR of 240 minutes. Find the availability.

10. Rocket Propulsion Company is considering the expansion of a solid-propellant manufacturing process by adding more 1-ton-capacity curing furnaces. Each batch (1 ton) of propellant must undergo 30 minutes of furnace time, including load and unload operations. However, the furnace is used only 80 percent of the time due to power restrictions in other parts of the system. The required output for the new layout is to be 16 tons per shift (8 hours). Plant (system) efficiency is estimated at 50 percent of system capacity. 10

(i) Determine the number of furnaces required.

(ii) Estimate the percentage of time the furnaces will be idle.