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BME-025

B.Tech. Mechanical Engineering (Computer Integrated Manufacturing)

Term-End Examination

00465

December, 2014

BME-025 : CONDITION MONITORING AND MAINTENANCE ENGINEERING

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any* ***seven*** *questions. All questions carry equal marks. Use of calculator is allowed.*

1. In a repair shop, there are five job orders P, Q, R, S and T to repair and the due dates are as follows :

Jobs	Repair time (Days)	Due date (Days from now)
P	12	20
Q	10	24
R	7	27
S	13	17
T	8	32

Prepare the sequence of repairing the above jobs by SPT rule. Also calculate *10*

(a) Total Completion time

(b) Average Completion time

(c) Average No. of Jobs in system

(d) Average Job lateness

2. Find the sequence that minimises the total elapsed time in hours to complete the following jobs on 3 machines. Also prepare Gantt Chart and idle times of machines : *10*

Jobs / Machines	P	Q	R	S	T
M1	3	8	7	5	2
M2	3	4	2	1	5
M3	5	8	10	7	6

3. What is A-B-C analysis ? Explain the step-by-step method to conduct the A-B-C analysis. *10*

4. What is codification ? What are the advantages of codification ? Also explain the codification significance in maintenance spare parts management. *10*

5. What do you understand about FMEA/FMECA ? Explain the steps in carrying out design FMECA. Also list out the applications and merits of FMEA/FMECA. *10*

6. A fleet owner finds from his past records that the cost per year of running a vehicle, whose purchase cost is ₹ 50,000 are as given below :

Year	Running Cost ₹	Resale Value ₹
1	5,000	30,000
2	6,000	15,000
3	7,000	7,500
4	9,000	3,750
5	15,000	2,000
6	16,000	2,000
7	18,000	2,000

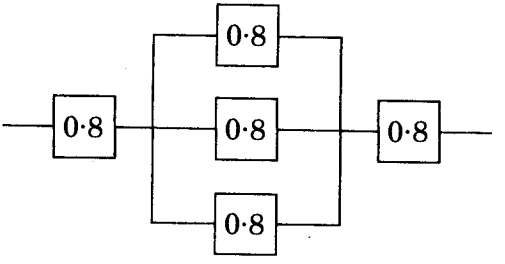
Thereafter running costs increase by ₹ 2,000, but resale value remains constant at ₹ 2,000. Find out at what age the machine replacement is due. *10*

7. A factory has a large number of bulbs, all of which must be in working condition. The durability of bulbs is given in the following table : *10*

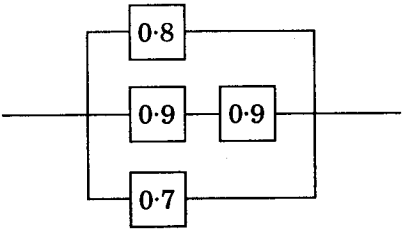
Week	Probability of bulbs failing during the week
1	0·10
2	0·15
3	0·25
4	0·35
5	0·12
6	0·03

If a bulb fails in service, it costs ₹ 3·50 to replace, but if all bulbs are replaced at a time, it costs ₹ 1·20 each. Find the optimum group replacement policy. (Assume 1000 bulbs available in the beginning).

8. (a) Find the reliability of the following combination of the components, whose reliabilities are shown in the blocks of the diagram : *5*



(b) Find the reliability of the following combination of the components, whose reliabilities are shown in the blocks of diagram : 5



9. (a) The cumulative operating time is found to be 60 hours in a system consisting of 120 components each having mean time between failure (MTBF) of 6000 hours. Find the reliability of the system. 5

(b) The reliability of a system is estimated at 0·8. On application of condition monitoring techniques, the reliability of a system is found to be improved to 0·9. Find the reliability improvement factor (RIF) and give your comments on its probability of failures. 5

10. Write short notes on any ***four*** of the following : $4 \times 2\frac{1}{2} = 10$

(a) Preventive Maintenance (PM)
(b) V-E-D Analysis
(c) Availability
(d) Total Productive Maintenance (TPM)
(e) Overall Equipment Effectiveness (OEE)