

Q.8 Write short note on the followings 5x4

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- Role of RCM to achieve the goal of high equipment availability.
- Role of CBM in the assessment of equipment performance..
- 'OEE' and its measure for world class equipments
- 'TPM' and its role in Industry.

BT-7/D11 : 7857

ME-437E : Maintenance Engineering

Time : Three Hours

Maximum Marks : 100

Note:- Attempt any five questions.

- Q.1 a) Define maintenance and its role in Industry
 b) Discuss various challenges to be faced in Industry in the execution of maintenance functions. 5x4
- c) Discuss best maintenance practices of an organization.
- d) The prime objective of maintenance is "Productivity improvement through maximum availability at optimum cost". Justify this statement with suitable examples.
- Q.2 a) What is maintenance excellence in an industry? Write its element for the development of an Integrated maintenance plan. 10
- b) Discuss m out of n redundancy used for large Industrial systems. 10

- Q.3 a) Write various uses and limitations of "CMM" system over the "MMS" 8

CMM → Computerized maintenance management

MMS → Manual maintenance system

- b) Classify maintenance performance indicators. Discuss each and give the bench mark value for a steel industry. 12

- Q.4 a) Define the following in reference to the world class equipments 8

i) Reliability and availability

ii) Maintainability

- b) A system is comprised of four serially related components each having a weibull time distribution with parameter as given below. compute system reliability for 100 hrs operation time. 12

Components	1	2	3	4
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Scale parameter	100	150	510	720
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shape parameter	1.20	0.87	1.80	1.00
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- Q.5 a) Discuss maintenance budgeting, its measures for control in Industry. 8

- b) If the cost of each replacement in rupees is 2000 then what will be the total cost of operation per year for the selected replacement policy. A system is scheduled to operate for 2000 hrs per year. The system MTBF and MTTR are 400 hrs and 20 hrs respectively. Calculate the annual labour cost of corrective maintenance if the maintenance labour cost is rupees 100 per hour. 12

- Q.6 a) Discuss various parameters of maintainability. 4

- b) An electrification system contains 12000bulbs. when any bulb fails it is replaced. The cost of replacing a bulb individually is Rs 10 only. If all the bulbs are replaced at the same time, the cost per bulb would be Rs 4 only. The percentage of surviving bulbs is $s(t)$ at the end of month t and $p(t)$ is the probability of failure during the month t are given as:

t	0	1	2	3	4	5	6
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$s(t)$	100	97	90	70	30	15	0
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$p(t)$	--	.03	.07	.20	.40	.15	.15
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Find the optimal replacement plan.

- Q.7 a) Discuss various replacement models and their limitations. 12

- b) Define/Discuss various failure patterns which may occur in industrial equipments. 8