

Lukhdhirji Engineering College, Morbi

Department of Mechanical Engineering

Assignment 4. Replacement Theory (CO4)

Subject: Operation Research (3151910)

Semester: 5th

Year: 2022-23

1. A firm is considering replacement of a machine, whose cost price is Rs. 12,200 and the scrap value Rs. 200. The running costs are found from experience to be as follows.

Year	1	2	3	4	5	6	7	8
Running Cost Rs.	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced?

2. Following failure rates have been observed for certain type of light bulbs;

Month	1	2	3	4	5
Percentage of items failing by end of month	10	25	50	80	100

There are total 1000 bulbs in use and it costs Rs. 10 to replace an individual bulb which has fused out. If all bulbs are replaced simultaneously, it would cost Rs. 4 per bulb. Two policies are being considered for replacement of bulbs; First, replace all bulbs simultaneously at fixed interval whether failed or not and do individual replacement in intermediate periods. Secondly, individual replacement of bulbs as and when it fails. Determine the optimum policy for replacement of bulbs based on above failure data and costs.

3. An electronic item contains 10000 resistors. When any resistor fails, it is replaced. The cost of replacing a resistor individually is Rs. 1 only. If all resistors are replaced at the same time, the cost per resistor reduces to 35 paise. The probability of failure of a resistor by the end of month is given in table below.

Month	1	2	3	4	5	6
Prob. of items failing by end of month	0.03	0.07	0.2	0.4	0.15	0.15

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To deliver quality engineering education for Mechanical Engineers with Professional competency, Human values and Acceptability in the society.

Mission of the Department:

- To nurture engineers with basic and advance mechanical engineering concepts
- To impart Techno-Managerial skill in students to meet global engineering challenges
- To create ethical engineers who can contribute for sustainable development of society

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4. A machine cost Rs 500. Operation and maintenance cost are zero for the first year and increases by Rs. 100 every year. If money is worth 5% every year, determine the best age at which the machine should be replaced. The resale value of the machine is negligibly small. What is the weighted average cost of owning and operating the machine?
5. A person is planning to purchase a car. A new car is costing rupees 3 lacs. The resale value of the car at the end of the year is 85 % of the previous year. Maintenance and repair cost during the first year are rupees 10000 and they increase by 15 % every year. The minimum resale value of the car can be rupees 75000. (a) When should the car be replaced to minimize average annual cost? (b) If interest rate of 12 % is assumed, calculate the average cost at the end of 10 years.
6. A company is presently buying an item of worth Rs.90,000/- from a supplier at an optimal purchasing policy at a discount of 1%. Presently the ordering cost is Rs.100/- per order and 20% as inventory handling cost of the average inventory level. The company receives another two offers from the other suppliers. First supplier offers 5% discount if the order is placed twice a year and second supplier offers 3% discount if the order is placed quarterly a year. Which offer the company should accept?
7. The value of the money is 10 % per year. Machine-1 is to be replaced every 3 years and Machine -2 is to be replaced for every 6 years with yearly expenditure as given below. Which machine costs less?

Expenditure (in rupees)		
Year	Machine:-1	Machine:2
1	2000	3400
2	400	200
3	800	400
4	---	600
5	---	800
6	---	1000

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8. As new automobile vehicle costs of Rs. 10000 and it can be sold at the end of any year with the selling price as shown below. The operating and maintenance cost are given year wise in following table. Find when the automobile vehicle needs to be replaced because of wear and tear.

Expenditure (in rupees)		
Year	Selling Price (Rs.)	Operating and maintenance cost (Rs.)
1	7000	1000
2	5000	1600
3	3000	1800
4	2000	2500
5	1000	3000
6	500	3500

9. A firm is considering replacement of a machine whose cost price is Rs.12200& the scrap value Rs.200.The running costs are found from experience to be as follows. When should the machine be replaced?

Year	1	2	3	4	5	6	7	8
Running cost Rs.	200	600	700	1000	1200	1800	2500	4000

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