2017

STATISTICS

(Major)

Paper : 5.4

(Operation Research)

Full Marks : 60

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Answer the following questions : 1×7=7

(a) Define the term 'depreciation value'.

(b) What is replacement problem?

(c) State whether the following statement is correct or not :

"One should group replace at the end of the tth period, if the cost of the individual replacements at the end of $(t-1)$th period is less than the average cost per period through the end of the t th period."

(d) In connection with inventory model, state the full form of ABC.

(e) What is economic ordering quantity?

(f) Define the term 'total float' in connection with critical path analysis.

(g) Fill in the blank :

The _____ time represents the longest time the activity could take if everything goes wrong.

2. Answer the following questions in short : 2×4=8

(a) List two differences between CPM and PERT.

(b) State any three limitations of ABC analysis.

(c) Define the following :

(i) Lead time

(ii) Holding costs

(d) Briefly explain what do you mean by individual and group replacement policy.

3. Answer any *three* of the following questions : 5×3=15

(a) A machine costs ₹ 9000. Annual operating cost is ₹ 200 for the first year,

and then increases by ₹ 2000 every year. Determine the best age at which the machine should be replaced. If the optimum replacement policy is followed, what will be the average yearly cost of owning and operating the machine? (Assume that the machine has no resale value when replaced and that future costs are not discounted.)

(b) Explain in brief the following terms commonly used in network of PERT/CPM :

(i) Dummy activity

(ii) Expected time

(iii) Critical path

(c) Derive the economic lot size with different rates of demand in different cycles.

(d) Write a brief note on "Replacement policy of items which deteriorate with time".

4. Answer the following questions : 10×3=30

(a) Find the optimum replacement policy which minimizes the total of all future discounted costs for an equipment, which costs ₹ A and which needs maintenance costs of ₹ C_1, C_2, ..., C_n, etc., ($C_{n+1} > C_n$) during the first, second, ... years, etc., respectively and further d is the depreciation value per unit of money during a year.

Or

Explain how the theory of replacement is used in the problem of replacement of items that fail completely.

(b) Define inventory. Explain clearly the various costs that are involved in inventory problems with suitable examples. Why is inventory maintained?

Or

A manufacturing company used an EOQ (Economic Ordering Quantity) approach in planning its production of gears. The following information is available :

Each gear costs ₹ 250 per unit, annual demand is 60000 gears, setup costs are ₹ 4,000 per setup, and the inventory carrying cost per month is established at 2 percent of the average inventory value. When in production; these gears can be produced at the rate of 400 units per day and this company works for only 300 days in a year.

Determine—

(i) the economic lot size;

(ii) the number of production runs per year;

(iii) the total inventory cost.

(c) Write a brief note on time estimates and critical path in network analysis.

Or

Draw the network diagram from the following activities and find critical path and total float of activities :

Job	*Job time* (days)	*Immediate predecessors*
A	13	—
B	8	A
C	10	B
D	9	C
E	11	B
F	10	E
G	8	D, F
H	6	E
I	7	H
J	14	G, I
K	18	J

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