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OPTIMIZATION TECHNIQUES–I

Paper–305/304

Semester–III

(Common for MC & B.Sc. Hons.
in Mathematics Part–II) Sem.–III

Time Allowed : 3 Hours] [Maximum Marks : 70

Note : The candidates are required to attempt **two** questions each from Sections A and B carrying 10 marks each and the entire Section C consisting of 10 short answer type questions carrying 3 marks each.

SECTION—A

1. Derive the optimal economic lot size formula $q = \sqrt{\frac{2rC_3(C_1 + C_2)}{C_1C_2}}$ in the usual notations when the production rate is instantaneous, lead time is zero and shortage are allowed and backlogged. Also, derive the minimum cost formula.

2. Given the following data for an item of uniform demand instantaneous delivery time and back order facility: Annual Demand = 800 units; Cost of an item = ₹40; Ordering cost = ₹800; Inventory carrying = 40%; Back order cost = ₹10. Find out :

   (a) Minimum cost order quantity.

   (b) Maximum number of back orders.

   (c) Maximum inventory levels.

   (d) Time between order.

   (e) Total annual cost.

3. The demand of an item is uniform at a rate of 25 units per month. The fixed cost is ₹15 each time a production run is made. The production cost is ₹1 per item, and the inventory carrying cost is ₹0.30 over item per month. If the shortage cost is ₹1.50 per item per month, determine how often to make a production run, and of what size is should be.

4. A purchase manager has decided to place order for minimum quantity of 500 Nos. of a particular item in order to get a discount of 10%. From the records, it was found out that in the last year, 8 order each of size 200 Nos. have been places. Given ordering cost = ₹500 per order, inventory carrying cost = 40% of the inventory value and the cost per unit = ₹400. Is the purchase manager justified of his decision ? What is the effect of his decision to the company ?

SECTION—B

5. Six jobs go first over machine I and then over II. The order of completion of jobs has no significance. The following table gives the machine times in hours for six jobs on the two machines :

Job No.	1	2	3	4	5	6
Time no machine I	5	9	4	7	8	6
Time no machine II	7	4	8	3	9	5

Find the sequence of the jobs that minimize the total elapsed time to complete the jobs.

6. Consider the following data of a project :

Activity	A	B	C	D	E	F	G	H
Predecessor(s)	–	–	A	A	A	B,C	D	E,F,G
Optimistic time	2	10	8	10	7	9	3	5
Most likely time	4	12	9	15	7.5	9	3.5	5
Pessimistic time	12	26	10	20	11	9	7	5

(a) Draw the PERT network for the above project.

(b) Find the excepted duration and variance of each activity.

(c) Find the critical path and the expected project completion time.

7. Consider the data of the project, find its critical path and project duration :

Activity	Predecessor	Duration (in days)
A	–	4
B	–	6
C	A	9
D	B	7
E	C,D	5
F	B	4
G	E	3
H	E	6
I	F,G	9
J	H,I	4

8. What do you understand by Simulation ? Explain briefly its limitations and advantages too ?

SECTION—C

9. Write answer the following :

(i) In a central grain store, it takes around 15 days to get the stock after placing the order and daily 500 tons are despatched to neighbouring markets. On the adhoc basis safety stock is assumed to be 10 days stock. Calculate the recorder point.

(ii) Write a short note on Economic lot size problem.

(iii) Define total, free and independent floats.

(iv) Draw the network diagram based on the following information:

Activity	A	B	C	D	E	F	G
Preceding activity	–	A	–	C	B	D,E	F
Durations (days)	4	7	6	5	7	6	5

(v) Explain in details, what constitutes the ordering cost and carrying cost.

(vi) Write the limitation of the simulation phases.

(vii) Write the difference between CPM and PERT.

(viii) Define Monte Carlo Simulation.

(ix) Write a short note on sequencing.

(x) How will you solve the sequencing problem of n jobs on m machines ?