This question paper contains 3 printed pages

7233

Roll No

M. Sc. /I

OPERATIONAL RESEARCH –Course V

(Inventory Management)

(Admissions of 2001 and onwards)

J

Time 3 hours Maximum Marks 75

(Write your Roll No on the top immediately on receipt of this question paper)
Attempt five questions in all including question no 1 which is compulsory

1 (a) Discuss the effect of each of the following on the Basic EOQ model

(i) the ordering cost is to be reduced to half,
(ii) the annual demand is doubled,
(iii) the carrying cost is doubled 6

(b) A corporation has the following 10 items in inventory Carry out their ABC classification Represent the findings graphically

Item	Annual Consumption	Unit Cost (Rs)
A2	3000	50
B8	4000	12
C7	1500	45
D1	6000	10
E9	1000	20
F3	500	500
G2	300	1500
H2	600	20
I5	1750	10
J8	2500	5

9

2 (a) Show that the optimal order quantity does not lie on any of the price breaks when the incremental quantity discounts are offered 7

(b) A bike shop stocks a high volume items which has a normally distributed demand during the reorder period The average daily demand is 50 units, the lead time is 4 days and the standard deviation of demand during reorder period is 10

(i) How much safety stock provides a 95% service level by the company ?

(ii) What is the reorder point ? 8

3 (a) The annual demand for an item is 4000 units The cost to process an order is Rs 20 and annual holding cost is Rs 2 per unit per year What is the optimal order quantity, given the following price breaks for purchasing the item ?

Quantity	Cost/Unit (Rs.)
1-499	2 50
500-4999	2 30
5000 or more	2 25

9

(b) Find the optimum order quantity for a product with discrete demand having instantaneous supply and no stock out Under what conditions does this model reduce to that of continuous unit model ? 6

4 (a) What are the components involved in ordering, holding and stock out costs in an inventory system ? 7

(b) A company maintains a stock of 30-liters - hot water heaters that it sells and installs for its customers Hot water heater sales over the past 50 weeks are given below

Hot Water Heater Sales per Week	**Number of Weeks**
4	6
5	5
6	9
7	12
8	8
9	7
10	3

(i) If the company maintains a constant supply of 8 hot water heaters in any given week, how many times will the company be out of stock during 16 weeks simulation? [Given the sequence of random numbers as 10 24 03 32 23 59 95 34 43 51 08 18 66 97 03 96]

(ii) What is the average number of sales per week (including stock out) over the 16 weeks ? 8

5 (a) Find the optimal reorder levels for the generalized economic lot size model Usual notation may be used 5

(b) A firm produces three products A_1, A_2 and A_3 in lots The firms storage space is limited to 1300 sq ft further they can not invest more than Rs 21,000 on inventories The other relevant information is given below

Item	A_1	A_2	A_3
Demand rate (units/year)	5000	2000	10,000
Ordering Cost (Its/order)	100	200	75
Purchase Cost (Rs /unit)	10	15	05
Floor area required (sq ft /unit)	0 7	0 8	1 4

Inventory carrying charge is 20% per year If no stock outs are allowed, determine the optimal lot size for each of the product 10

6 Find the optimal order quantity in discrete instantaneous stochastic model, where shortages are completely lost and lead time is one period Setup cost is negligible 15

Appendix A. Areas Under the Standard Normal Table

Example : To find the area under the normal curve, you must know how many standard deviations that point is to the right of the mean. Then, the area under the normal curve can be read directly from the normal table. For example, the total area under the normal curve for a point that is 1.55 standard deviations to the right of the mean is .93943.

	00	01	02	03	.04	.05	.06	.07	08	09
0 0	.50000	.50399	.50798	51197	51595	.51994	52392	.52790	.53188	.53586
0 1	53983	.54380	54778	55172	.55567	.65962	.56356	.56749	.57142	.57535
0 2	57926	.58317	.58706	59095	59483	59871	.60257	.60642	.61026	.61409
0 3	.61791	.62172	62552	62930	.63307	.63683	.64058	.64431	.64803	.65173
0 4	65542	65910	.66276	.66640	67003	67364	.67724	.68082	.68439	.68793
0 5	69146	.69497	.69847	70194	70540	.70884	.71226	.71566	.71904	.72240
0 6	72575	.72907	.73237	.73576	.73891	74215	.74537	.74857	.75175	.75490
0 7	75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
0 8	78814	.79103	.79389	.79673	79955	.80234	.80511	.80785	.81057	.81327
0 9	81594	.81859	82121	82381	.82639	82894	83147	.83398	.83646	.83691
1 0	.84134	.84375	84614	84849	85083	.85314	.85543	.85769	.85993	.86214
1 1	86433	.86650	.86864	87076	.87286	.87493	87698	.87900	.88100	.88298
1 2	88493	88686	.88877	89065	89251	.89435	.89617	.89796	.89973	.90147
1 3	.90320	.90490	.90650	90824	90988	.91149	.91309	.91456	.91621	.91774
1.4	91924	.92073	.92220	.92364	92507	92647	.92705	.92922	.93056	.93189
1 5	93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
1 7	95543	.95637	95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
1 8	96407	.96485	.96562	96638	.96712	.96784	.96856	.96926	.96995	.97062
1 9	97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
2 0	97725	.97784	97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
2 1	98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574
2 2	98610	.98645	.98679	98713	98745	.98778	.98809	.98840	.98870	.98899
2.3	.98928	98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.99158
2 4	.99180	.9920[illegible]	99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
2.5	.99370	.9939[illegible]	99413	.99430	.99446	.99461	.99477	.99492	.99506	99520
2 6	.9953[illegible]	9954[illegible]	.99560	.99573	.99585	.99598	.99509	.99621	.99632	.99643
2.7	.99653	.99[illegible]64	[illegible]9674	.99687	99693	.99702	.99711	.99720	.99728	.99730
2 8	.99744	.99752	.99[illegible]60	.99767	99774	.99781	.99780	.99795	.99801	.99807
2 9	99813	.99819	9982[illegible]	99831	.99838	.99841	.99846	.99851	.99856	.99861
3.0	.99865	.99869	.99874	.99878	.99882	.99886	.99899	.99893	.99896	.99900
3 1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.99929
3.2	.99931	99934	.99936	.9993[illegible]	.9994C	.99642	.99944	.99946	.99948	.99950
3.3	.99952	.99953	99955	.99957	.99958	.99960	.99961	.99962	.99964	99965
3 4	99966	.99968	.99969	.99970	99971	.99972	.99973	.99974	.99975	.99976
3 5	.99977	.99978	.99978	.99979	99480	.99981	.99981	.99982	.99983	99983
3 6	.99984	.99905	99985	99986	.99986	.99987	.99987	.99988	.99988	.99989
3 7	.99989	.99990	.99990	.99990	99991	.99991	.99992	.99992	.99992	99992
3 8	.99993	.99993	.99993	99994	99994	99994	.99994	.99995	.99995	.99995
3 9	99995	.99995	.99996	99996	99996	99996	.99996	99996	99997	.99997