T.Y. B.Sc. Question Bank Paper III **Unit III**

A) Inventory

1. Describe inventory problem. Explain with suitable example the different costs that are involved in the inventory problem.
2. Describe the problem of inventory w.r.t. a) Deterministic model b) Probabilistic model.
3. Given the following conditions: - C_1 – holding cost/ unit / unit time C_2 – Shortage cost / unit / unit time C_3 - Set up cost / production run. Q – no. of units produced per production cycle. R – Demand rate. t - interval between two productions cycles. Find an expression for optimum value of q, t and minimum average cost per unit time. What would be change in your result if (i) Shortages are not permitted? (ii) Production rate is infinite.
4. Find the optimum order level so as to minimize the total expected cost where't' is the scheduling period which is given and is constant. Z – stock level to which the stock is raised at the beginning of every period t, f (x) is p.d.f. of demand x, which is known. C_1 – holding cost/unit/unit time. C_2 – Shortage cost/unit/unit time is zero production is instantaneous, demand during the period is uniform.
5. Determine EOQ under the following conditions of an inventory problem. t – constant intervals between the orders. S – stock in discrete units for duration t, C_1 & C_2 are holding costs and shortage costs per unit per unit time respectively. . 'd' is the demand having p.m.f. P (d) lead time is zero. Demand is instantaneous.
6. Find the optimum level to which the stock should be raised at the beginning of every period t (is known & fixed) if demand x is discrete r.v. having p.m.f. P (x) The per unit costs of over stock & under stock are respectively C_1 & C_2/unit of time. Also demand occurs at uniform rate.
7. What are the various factors, which i) encourage ii) discourage maintaining an inventory in the organization.
8. A manufacturer has to supply his customer R units over a period T. The manufacturer is faced with problem of deciding how many units to produce in one run. His decision is based on the following considerations. i) C_1- Inventory holding cost/unit/time ii)Shortages are not allowed iii) Production is instantaneous. iv) C_s is the set-up cost/run. Obtain an expression for EOQ & total relative cost cast is altered? (if at all).
9. In a certain manufacturing situations C_1 & C_2 are holding & shortage costs per item/unit time respectively. C_3 is the setup cost/production cycle, 'r' is the demand

rate and production rate is infinite. 't' is the interval between the short of successive production cycles. 'q' the no. of items produced/production run (q= rt). Find an expression for i) Optimum order quantity. ii) Minimum cost/unit time

10. A commodity is to be supplied at a rate of 200 units/day. Supplies of any amount can be had at any required time but each ordering cost of Rs. 50; cost of holding the commodity in inventory is Rs. 2/unit/day. While delay in the supply of an item induces a penalty of Rs. 10/ delay of one day. Find the optimal policy (q, t), What would be the best policy of penalty cost become infinity?
11. Explain how will you obtain the EOQ in the case of a problem with two price breaks
12. The p.d.f. of demand of a certain item during a week is f(x)=1/10 0<x<10.

    A demand is assumed to occur with a uniform pattern over the week. If the carrying & shortage costs/unit are Rs. 4 & Rs.2 per week respectively. Obtain an equation for determining the optimal order level of inventory.
13. The demand for a certain type of the product is a continues r.v. having rectangular distribution over (1000, 2000)

    a) Find the optimum order quantity of the holding cost is Rs. 2/unit & Shortage cost Rs.6/unit. b) Derive the formula that you have used assuming that demand is instantaneous.

B) **GAME THEORY**

1) Explain the following terms:-
   a) Competitive game
   b) Pay-off Matrix
   c) Two-person zero –sum game
   d) Saddle point
   e) Pure strategy & mixed strategy
   f) Minimax & Maximax Strategies
   g) Value of the game
2) Explain the dominance property.
3) Describe the graphical method for solving 2xn & mx2 game.
4) For 2X2 game without saddle point, show that value of the game is given by

$$v = \frac{a_{11}a_{22} - a_{12}a_{21}}{(a_{11} + a_{22}) - (a_{12} + a_{21})}$$

where (aij) is a pay-off matrix for the player 'A'.

Unit 1

Epidemics

1) Explain the following terms.
   i) Incubation period ii) Latent period iii) Serial interval iv) Infectious period v)Host and vector
2) For a simple epidemic deterministic model with no removals and ‘a; infections introduced in a group of ‘n’ susceptibles obtain an equation for epidemic curve. When this curve attains maximum. Obtain the values of number of susceptibles and infectives at that time.
3) Explain general epidemic model; derive an explicit expression for number of removals at any time‘t’.
4) Explain general epidemic model; derive an explicit expression for number of infectives at any time t when it is maximum.
5) For deterministic carrier model obtain an expression for the number of carriers at time t, stating clearly the assumptions. Also obtain an expression for total size of an epidemic.
6) State and prove threshold theorem for general epidemic after stating the assumptions.
7) For the Host-vector model state & prove modified Threshold theorem after stating the assumptions.
8) What are Chain binomial models? Distinguish between Reed frost model & Greenwood Model.
9) For a household of size 4 with double introduction obtain the probabilities of all types of chains by using Green-Wood model. If the frequencies of various chains are available for N households explain how will you estimate p - the prob. of adequate contact.
10) For a household of size 4 with single introduction obtain the probabilities of all types of chains by using Reed-Frost model. If the frequencies of various chains are available for N households explain how will you estimate p- the prob. of adequate contact.
11) For household of size 3 the frequencies of the chains {1} $\{1^2\}$, {13}, {1,2} are a, b, c, d, respectively. Assuming Reed-Frost model obtain an estimate of p, Also find its S.E.

12) For a household of size 4 if the frequency of chains $\{1\}$, $\{1^2\}$ $\{1^3\}$, $\{1,2\}$,$\{1^4\}$, $\{1,2,1\}$, $\{1,1,2\}$ & $\{1,3\}$ are given as a, b ,c, d, e, f, g & h respectively by using Green-Wood model obtain an estimate of P.

13) What are chain binomial model {1}, {1,1,1}, {1,2} and a, b, c, d respectively . Assuming R.F. model, obtain an estimate of p – the chance of adequate contact also find its S.E.

14) State the assumption of R.F. model. In usual notation write the expression for R.F. probability, $P[S_{t+1}/S_t, r_t]$ Further if aP^1 n j is the R.F. prob. that a group of total size 'n' will have a total of j cases when there are 'a' introduction. Prove that

a $P^{'}$ n, j α a P' j, j .

15) State the assumption of Reed frost & Greenwood Model in usual notations write down the [St+1/rt,St] for both the above models. Hence obtain the probability of $\{S_0, S_{1,\ldots\ldots} S_k\}$ by using both the models.

16) If m P n, N denote the probability that in a household of size n there are N cases with m introductions. Find the expression for m P n, N by using Greenwood model.

17) For a household of size 8 obtain the prob. for chain {2, 3} {3, 4} by using Greenwood & Reed-wood model.

18) If $_m P_{n,\ N}$ denote the Greenwood prob. in a household of size n & N cases are observed the corresponding Reed -frost prob. is denoted by mP^{1n} N if

i. $_3P_{4,4} = 3P^1 44$. Find the value of p

ii. If $_3 P_{5,3}$ = 1/4 find p

iii. $2P1_{5,2}$ = ¼ find the value of p.