Assignment: operations research and linear programming assignment

Q. 1. What is a linear programming problem ? Discuss the steps and role of linear programming is solving management problems. Discuss and describe the role of liner programming in managerial decision-making bringing out limitations, if any. Ans : Linear Programming is a mathematical technique useful for allocation of scarce or limited resources to several competing activities on the basis of given criterion of optimality. The usefulness of linear programming as a tool for optimal decision-making on resource allocation, is based on its applicability to many diversified decision problems.

The effective use and application requires, as on its applicability to many diversified decision problems. The effective use and application requires, as a first step, the mathematical formulation of an LP model, when the problem is presented in words. Steps of linear programming model formulation are summarized as follows : STEP 1 : Identify the Decision Variables a) Express each constraint in words. For this you should first see whether the constraint is of the form >/ (at least as large as), of the form < (no larger than) or of the form = (exactly equal to)) You should then verbally express the objective function c) Steps (a) and (b) should then allow you to verbally identify the decision variables If there are several decision alternatives available , then in order to identify the decision variables you need to ask yourself the question – what decisions must be made in order to optimize the objective function ? Having accomplished step 1(a) through (c) decide the symbolic notation for the decision variables and specify units of measurement. Such specification of units of measurement would help in interpreting the final olution of the LP problem . STEP 2 : Identify the Problem Data For solving a problem, we need to identify the problem data so as to

provide the actual values for the decision variables. For this, we need to enumerate all types of information with respect to the given problem in order to determine the values of these decision variables. These quantities constitute the problem data. It may be noted that the decision-maker can control values of the variables but cannot control the values of the data STEP 3 : Formulate the constraints) Verbally express the constraints in terms of the requirements and availability of each resource. b) Convert the verbal expression of the constraints imposed by the resource availability as linear equality or inequality , in terms of the decision variables defined in step 1 These constraints are the conditions in that the decision variable must satisfy in order to constitute an acceptable (feasible) solution. These constraints typically arise due to physical limitations, management imposed restrictions , external restrictions , logical restrictions on individual variables , implied relationships among variables etc.

Wrong formulation can either lead to solutions that are not feasible ir ti tge exclusion of some solutions that are actually feasible and possibly optimal. STEP 4 : Formulate the objective function Identify the objective function is to be maximized or minimized. Then express it verbally – maximize total profit/cost and then conver it into a linear mathematical expression in terms of decision variables multiplied by their profit or cost contributions

After having enough experiences in model building one may skip verbal description, the following are certain examples of LP model formulation that you can use to strengthen your ability to translate a real – life problem into a mathematical model . Linear Programming used in Marketing management • Media Selection : The linear programming technique helps in determining the

advertising media mix so as to maximize the effective exposure, subject to limitation of budget, specified exposure rates to different market segments.

Specified minimum and maximum number of advertisements in various media • Travelling sales problem : The salesman’s problem is to find the shortest route from a given duty to each of the specified cities and then returning to the original point of departure , provided no city would be visited twice during the tour such a type of problems can be solved with the help of the modified assignment technique . • Physical distribution : Linear programming determines the most economic and efficient manner of locating manufacturing plants and distribution centres for physical distribution.

Q. 2. Explain the concept and computational steps of the simplex method for solving linear programming problems. How would you identify whether an optimal solution to a problem obtained using simplex algorithm in unique or not ? What is the difference between a feasible solution, a basic feasible solution, and an optimal solution of a linear programming problem ? What is the difference between simplex solution procedure for a maximization and a minimization problem? Using the concept of net contribution, provide an intuitive explanation of hy the criterion for optimality for maximization problem is different from that of minimization problems. Outline the steps involved in the simplex algorithm for solving a linear programming maximization problem. Also define the technical terms used therein. Ans : Q. 3. “ Liner programming is one of the most frequently and successfully employed Operations Research techniques to managerial and business

decisions” Elucidate this statement with some examples. Q. 4. Describe the transportation problem and give its mathematical model.

Explain by taking an illustration, the North-west corner rule, the least cost method and the vogel’s approximation method to obtain the initial feasible solution to a transportation problem. Discuss the various methods of finding initial feasible solution of a transportation problem and state the advantages, disadvantages and areas application for them Q. 5. What is an assignment problem ? It is true to say that it is a special case of the transportation problem ? Explain. How can u formulate an assignment problem as a standard linear programming problem ? Illustrate.

What do u understand by an assignment problem? Give a brief outline for solving it. Q. 6. What is queuing theory ? What type of questions are sought to be answered in analyzing a queuing system ? Give a general structure of the queuing system and explain. Illustrate some queuing situations. In what types of problem situation can it be applied successfully ? Discuss giving examples. Q. 7. What kind of decision-making situations may be analyzed using PERT and CPM techniques ? State the major similarities between PERT and CPM. Under what circumstances is CPM a better technique of project management than PERT A construction company has received a contract to build and office complex. It has frequently engaged itself in constructing such buildings. Which of the two network techniques PERT And CPM should in your opinion, be employed by the company? Why ? Q. 8. What is simulation? Describe the simulation process. State the major two reasons for using simulation to solve a problem. What are the advantages and limitations of

simulation? When it becomes difficult to use an optimization technique for solving a problem, one has to resort to simulation. Discuss.

Simulation is typically the process of carrying out sampling experiments on the models of the system rather than the system itself. Elucidate this statement by taking some examples. Q. 9. A company has three offers for its existing equipment in one of the divisions. The first buyer is willing to pay Rs. 50, 000 at the end of 8 years period. The second buyer offers Rs. 39, 000 consisting of an immediate payment of Rs. 14, 000 and Rs. 25, 000 after 6 years. The third buyer agrees to buy the equipment for Rs. 29, 000 payable right away. Which is the best offer for the company if it can earn an interest @8% p. a. on the money received ?