Operations Research

1) What is operations research?

Operations research is the application of scientific methods to complex problems arising from operations involving large systems of men, machines, materials and money in industry, business, government and defence.

2) What are the main characteristics of operations Research?

Characteristics of operations research are,

(i) Its system orientation

(ii) The use of inter-disciplinary forms

(iii) application of scientific method.

(iv) uncovering of new problems.

3) Define optimal solution.

Any feasible solution which optimizes (minimizes (or) maximizes) the objective function is called its optimal solution.

4) What is the difference between feasible solution and basic feasible solution?

The solution of m basic variables when each of the $(n-m)$ non-basic variables is set to zero is called basic solutions.

A basic solution in which all the basic variables are 0 is called basic feasible solution.

5) What are the two forms of an LPP?

The two forms of LPP are

(i) standard form

(ii) canonical form.

6) What is key column and how is it selected?

Key column is the column which gives the entering variable column and is selected by finding the most negative value of $Z_j - C_j$

7) What are the methods used to solve an LPP involving artificial variables?

(i) Big-M method (or) penalty cost method.

ii) Two-phase simplex method.

8) Define artificial variables

Any non-negative variable which is introduced in the constraints in order to get the initial basic feasible solution is called artificial variable.

9) When does an LPP possess a pseudo-optimal solution?

An LPP possesses a pseudo-optimal solution, if at least one artificial variable is in the basis at positive level even though the optimality conditions are satisfied.

10) What is degeneracy?

The concept of obtaining a degenerate basic feasible solution in a LPP is known as degeneracy.

11) List any three approaches used with transportation problem for determining the starting solution.

   i) North-west corner rule.

   ii) Least cost method

   iii) Vogel's approximation method.

12) What do you mean by an unbalanced Transportation problem?

Any transportation problem is said to be unbalanced if $\sum_{i=1}^{m} a_i \neq \sum_{j=1}^{n} b_j$

ie) if the total supply is not equal to the total demand.

13) What is an assignment problem?

The problem of assigning the number of jobs to equal number of facilities at a minimum cost or maximum profit is called an assignment problem.

14) What do you mean by an unbalanced assignment problem?

If the number of rows is not equal to the number of columns in the cost matrix of the assignment problem (or)

If the cost matrix of the given assignment problem is not square matrix, then the given assignment problem is said to be unbalanced.

15) State the difference between Transportation problem and assignment problem.

The differences between Transportation problem and assignment problem are.

i) The cost matrix in T.P is not necessarily square matrix, whereas in A.P is a square matrix.

(ii) Supply and demand at any source and at any destination may be positive quantity a_i, b_j in T.P. whereas in A.P it will be 1

ie) $a_i = b_j = 1$.

iii) The allocations x_{ij} in the case of T.P can take any positive values satisfying the rim requirements, whereas in A.P, x_{ij} will take only two possible values 1 or 0.

16) What is a sequencing problem?

Sequencing gives us an idea of order in which things happen or come in event. Suppose there are n jobs, each of which has to be processed one at a time at m machines. The order of processing each job through each machine is given. The problem is to find a sequence among $(n!)^m$ number of all possible sequences for processing the jobs so that the total elapsed time for all the jobs will be minimum.

17) What is no passing rule in sequencing problem?

It refers to the rule of maintaining the order in which jobs are to be processed on given machines. Let there be n jobs, each of which is to be processed through 2 machines, say M_1 & M_2 in the order $M_1 M_2$.

ie) each job has to pass through the same sequence of operations.

18) Define Total elapsed time.

This is the time between starting the first job and completing the last job, which also includes the idle time, if it occurs.

19) What do you mean by job sequencing?

Sequencing can be defined as the selection of an order for a series of jobs to be done on a number of service facilities. The purpose of sequencing problems is to complete the job within the minimum possible time, keeping the minimum idle-time of the machines.

20) How do you use johnson's rule?

(i) List the jobs and their times at each work center.

(ii) Select the job with the shortest activity time.

(iii) Eliminate the shortest job from further consideration

(iv) Repeat steps (ii) & (iii) working towards the center of the job schedule until all jobs have been scheduled.

21) What is a network?

It is the graphic representation of logically and sequentially connected arrows and nodes representing activities and events of a project.

22) What are the three types of floats?

(i) Total float
(ii) free float
(iii) Independent float.

Define total float.

The amount of time by which the completion of an activity could be delayed beyond the earliest expected completion time without affecting the overall Project duration time is called the total float.

24) Define critical activity.

An activity is said to be critical if a delay in its start will cause a further delay in the completion of the entire project.

25) what is the critical path?

The sequence of critical activities in a network is called the critical path.