Seat No. : _____

LG-122

April-2014

B.Sc. Sem.-VI

Statistics : CC-310

(Operations Research)

Time : 3 Hours] **[Max. Marks : 70**

Instructions : (1) **All** questions are compulsory. Each question carries equal marks.

(2) Statistical tables and graph papers will be provided on request.

(3) Use of scientific calculator is allowed.

1. (a) What is operations research ? State its uses and limitations.

OR

Define Linear Programming. With respect to Linear Programming Programme, Define :

(i) Objective function

(ii) Feasible solution

(iii) Optimum solution.

(b) Comment on the solutions obtained by Graphical method of the following Linear Programming Programme :

(i) Maximize $Z = 5X + 3Y$ subject to $4x + 2y \leq 8$, $x \geq 3$, $y \geq 7$, $x \geq 0$, $y \geq 0$

(ii) Maximize $Z = 4X + 2Y$ subject to $-x + 2y \leq 6$, $-x + y \leq 2$, $x, y \geq 0$.

OR

Define Duality in Linear Programming Programme.

Prove that Dual of Dual is Primal.

Verify the above statement for the following Linear Programming Programme :

Maximize = $10X + 5Y$ subject to $2X + 4Y \geq 16$, $X + 5Y \geq 15$, $X \geq 0$, $Y \geq 0$.

2. (a) Explain in brief transportation problem. Also state necessary and sufficient condition for the transportation problem to have the feasible solution.

OR

Determine the optimality of the following Transportation Problem using Vogel's Approximation method to the following T.P.

ORIGIN	DESTINATIONS			SUPPLY
	D1	D2	D3	
O1	5	1	7	30
O2	6	4	8	80
O3	3	2	5	35
Demand	75	20	50	

(b) What is an Assignment problem ? Give the Hungarian method of solving assignment problem.

OR

Solve the following Assignment problem to maximize the profit (in ₹) :

JOBS	WORKERS			
	A	B	C	D
I	41	47	43	48
II	42	44	45	46
III	43	45	48	44
IV	44	46	40	42

3. (a) Explain the Johnson's procedure to determine an optimum sequence for processing n items on 2 machines.

OR

In a factory, there are six jobs to perform. Each of which should go through two machines A and B in the order A – B. The processing timings (in hours) for the jobs are given. Determine the sequence for performing the jobs in order to minimize the total elapsed time T. Find the value of T.

Job	1	2	3	4	5	6
Machine A	1	3	8	3	6	3
Machine B	5	6	3	2	2	10

(b) Define "Replacement Problem". Describe the replacement policy for items that deteriorate with time under increase in maintenance cost while value of money remains same for the period under consideration.

OR

The purchase price of a machine is ₹ 15,000 = 00. The maintenance cost and resale value of a machine per year are given below :

Year	1	2	3	4	5	6	7	8
Cost (₹)	1000	1300	1400	2200	2900	3800	4800	6000
Resale value (₹)	5000	3000	1300	700	600	500	500	500

When should the machine be replaced ?

4. (a) Define terms PERT and CPM. Also, state their uses.

OR

For the project consisting of the following activities, draw network for the project and determine the critical path, total float, free float.

Activity	1–2	1–3	1–4	2–4	3–4	4–5
Activity (Time)	20	25	10	12	6	10

(b) Explain difference between PERT and CPM.

OR

Determine expected time and variance for the following project. Draw project network, calculate the length and variance of the critical path.

Activity	1–2	1–6	2–3	2–4	3–5	4–5	6–7	5–8	7–8
Optimistic time	5	18	26	16	15	6	7	7	3
Most likely time	10	22	40	20	25	12	12	9	0
Pessimistic time	8	20	28	18	20	9	10	8	4

5. Answer the following questions :

(a) What is a degenerate basic feasible solution ?

(b) The transportation problem is a special case of Linear programming problem. Do you agree ? If yes, why ?

(c) Why Vogel's Approximation method is better over the other available methods to derive the initial basic feasible solution ?

(d) State the assumptions in solving a sequencing problem.

(e) State the use of Replacement Theory.

(f) Define terms : most likely time, float, free float.

(g) State the mathematical form of assignment problem.

———————