



Name :

Roll No. :

Invigilator's Signature :

CS/MBA/SEM-4(PT)//MB-302/2013

2013

OPERATIONS RESEARCH

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

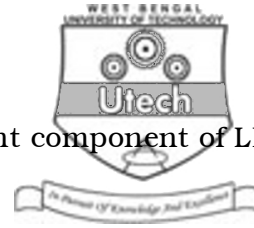
Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

- i) LPP is a
 - a) Constraint optimization technique
 - b) Technique for economic allocation of limited resources
 - c) Mathematical technique
 - d) All of these.
- ii) The distinguishing feature of an LP model is
 - a) Relationship among all the variables is linear
 - b) It has single objective function and constraints
 - c) Value of decision variables is non-negative
 - d) All of these.



- iii) Non-negative condition is an important component of LP model because
- a) Value of variables should remain under the control of decision maker
 - b) Value of variables makes sense and corresponds to real world problems
 - c) Variables are interrelated in terms of limited resources
 - d) None of these.
- iv) The number of basic variable in a transportation problem is
- a) at most $n + m - 1$
 - b) at least $n + m - 1$
 - c) equal to $n + m$
 - d) none of these.
- v) Constraints in a LP model represents
- a) Limitations
 - b) Requirements
 - c) Balancing limitations and requirements
 - d) All of these.



- vi) Assignment problem is solved by
- a) Hungarian method
 - b) MODI method
 - c) VAM
 - d) None of these.
- vii) VAM is a method to find
- a) Basic feasible solution of a transportation problem
 - b) Basic feasible solution of assignment problem
 - c) Optimal solution of transportation problem
 - d) Optimal solution of LPP.
- viii) Which of the following is true about a surplus variable ?
- a) It converts less than or equal to type constraint into equalities
 - b) It converts more than or equal to type constraint into equalities
 - c) It represents unused capacity
 - d) They require an addition of a slack variable.



- ix) Charnles Big M Method is a method to solve
- a) LPP method
 - b) Transportation method
 - c) Assignment method
 - d) Simplex method.
- x) Unbalanced assignment problem is that when
- a) It is a square matrix
 - b) It is a rectangular matrix
 - c) None of these
 - d) All of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Do the dual of the given primal problem :

Maximize $Z = 2x_1 + x_2$

Subject to : $x_1 + 3x_2 \leq 15$

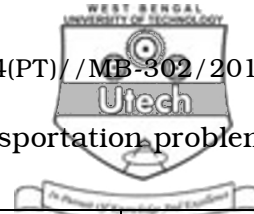
$3x_1 - 4x_2 \leq 12$

$x_1, x_2 \geq 0$

- 3.

Strategies	State of Nature N_1	State of Nature N_2	State of Nature N_3
S_1	7 lakhs	3 lakhs	1.5 lakhs
S_2	5 lakhs	4.5 lakhs	0 lakh
S_3	3 lakhs	3 lakhs	3 lakhs

What is the best strategy in respect to Minimax Regret, Laplace Criteria, Minimax and Maximax ?



4. Find the basic feasible solution of the transportation problem by Matrix Minima Method.

	W1	W2	W3	W4	a_i
F1	19	30	50	10	7
F2	70	30	40	60	9
F3	40	8	70	20	18
b_j	5	8	7	14	

5. What are the basic characteristics of $M/M/1$: FCFS queue ?
 6. What are the basic assumptions of LPP ?

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Solve the assignment problem :

	M1	M2	M3	M4	M5
J1	160	130	175	190	200
J2	135	120	130	160	175
J3	140	110	155	170	185
J4	50	50	80	80	110
J5	55	35	70	80	105

- b) A businessman has two independent portfolios A and B, available to him, but he lacks capital to undertake both of them simultaneously. He can either choose A first and then stop, or if A is not successful, then take B or vice versa. The probability of success of A is 0.6, while for B it is 0.4. Both investment schemes require an initial capital outlay of Rs. 10,000/- and both return nothing if the venture proves to be unsuccessful. Successful completion of A will return Rs. 20,000/- (over cost) and successful completion of B will return Rs. 24,000/- (over cost). Draw a decision tree to determine the best strategy.



8. Food X contains 6 units of Vitamin A and 7 units of Vitamin B per gram and costs Rs. 1.2/gm. Food Y contains 8 units and 12 units of A and B per gram respectively and costs Rs. 2/gm. The daily requirements of Vitamin A and Vitamin B are at least 100 units and 120 units respectively. Formulate the above as LPP and solve it.
9. A company manufactures around 200 mopeds. Depending upon the availability of raw materials and other conditions, the daily production has been varying from 196-204 mopeds, whose probability distribution is as given below :

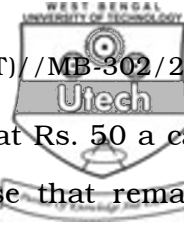
Production/day	196	197	198	199	200	201	202	203	204
Probability	0.05	0.09	0.12	0.14	0.2	0.15	0.11	0.08	0.06

The finished mopeds are transported in a specially designed three-storied lorry that can accommodate only 200 mopeds. Using the following 15 random numbers : 82, 89, 78, 24, 53, 61, 18, 45, 04, 23, 50, 77, 27, 54, 10, simulate the mopeds waiting in the factory.

What will be the average number of mopeds waiting in the factory ? What will be the average number of empty spaces in the lorry ?

10. Find the optimal solution of the following transportation problem :

	W1	W2	W3	W4	a_i
F1	19	30	50	10	7
F2	70	30	40	60	9
F3	40	8	70	20	18
b_j	5	8	7	14	



11. A retailer purchases cherries every morning at Rs. 50 a case and sells them for Rs. 80 a case. Any case that remains unsold at the end of the day can be disposed of the next day at a salvage value of Rs. 20 per case. Past sales have ranged from 15 to 18 cases per day. The following is the record of sales for past 120 days :

Cases sold	15	16	17	18
Number of days	12	24	48	36

- (i) Find how many cases the retailer should purchase per day to maximize his profit.
- (ii) What is the maximized profit if he has the perfect information ?
- (iii) What can he pay for getting the perfect information ?
