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 × 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 × 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 $M/M/I$: 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 ?