Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/B.Tech(IT)/SEM-5/M(CS)-511/2009-10

2009

OPERATION RESEARCH & OPTIMIZATION TECHNIQUES

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 any *ten* of the following : $10 \times 1 = 10$

i) If in the simplex algorithm, the basis column of the final simplex table contains an artificial variable, the problem has

a) degenerate solution

b) infeasible solution

c) unbounded solution

d) multiple solution.

ii) Intersection of two convex sets is also a convex set. The statement is

a) True b) False.

iii) A transportation problem is balanced iff

a) number of sources equals the number of destinations

b) total demand and total supply are equal and the number of sources equals to the number of destinations

c) total demand and total supply are equal irrespective of number of sources and destinations

d) none of these.

iv) Among all possible cuts in a transport network, the cut with the smallest capacity gives the maximum flow in the network. The statement is

a) True b) False.

v) A game is said to be two-person zero-sum game if

a) gain of one player is exactly matched by a loss of the other so that their sum is equal to zero

b) gain of one player does not match the loss of the other

c) both the players must have equal number of strategies

d) diagonal entries of the pay-off matrix are zero.

vi) The number of basic variables in a transportation problem is

a) at most $m + n - 1$ b) $n + 1$

c) $n - 1$ d) none of these.

vii) If any of the constraints in the primary problem be a perfect equality, then the corresponding dual variable is

a) always positive b) always negative

c) equal to zero d) unrestricted in sign.

viii) In critical path computation, the forward pass determines

a) latest occurrence times of events

b) earliest occurrence times of events

c) duration of activity

d) none of these.

ix) A hyper plane is a convex set. This statement is

a) True b) False.

x) In an assignment problem, the minimum number of lines covering all zeroes in the reduced cost matrix of order n can be

a) at most n b) $n + 1$

c) $n - 1$ d) at least n.

xi) If there are n workers and n jobs, there would be

a) $n!$ solutions b) $(n-1)!$ solutions

c) $(n!)^n$ solutions d) n solutions.

xii) When the sum of gains of one player is equal to the sum of losses to another player in a game, the situation is known as

a) biased game b) zero-sum game

c) fair game d) all of these.

GROUP – B

(Short Answer Type Questions)

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

2. Show that the following $2 \infty 2$ game is non-strictly determinable, if $a < b$, $a < c$, $d < b$, $d < c$.

a	b
c	d

3. What are the differences between PERT and CPM techniques ?

4. What is an unbalanced transportation problem ? How can it be solved ? Illustrate.

5. Explain the concept of degeneracy in transportation problem.

6. What are the slack and surplus variables in an LPP ? Explain with examples.

GROUP – C

(Long Answer Type Questions)

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

7. Find the value of the maximal flow for the following network by Ford-Fulkerson algorithm.

8. a) In a textile sales emporium, 4 salesman *A*, *B*, *C*, *D* are available to 4 counter *W*, *X*, *Y*, *Z*. Each salesman can handle any counter. How the salesman should be allotted the appropriate counter so as to minimize the service time from the following problem ? 8

	A	***B***	***C***	***D***
W	41	72	39	52
X	22	29	49	65
Y	27	39	60	51
Z	45	50	48	52

b) Solve the following transportation problem using Vogel's approximation method : 7

	A	***B***	***C***	***CAPACITY***
1	50	40	80	400
2	80	70	40	400
3	60	70	60	500
4	60	60	60	400
5	30	50	40	800
REQUIREMENT	800	600	1100	

10. a)

For the above network :

i) What is the probability that the project complete within 12 days [where $\Phi(0) = 0{\cdot}5$] ?

ii) What is the probability that event 5-will occur in 7 days after start [where $\Phi(0{\cdot}9486) = 0{\cdot}8276$] ?

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b) For the activity given below, draw the project network and find critical path, critical activity and project duration. 2 + 4

Activity	***Duration***
1 — 2	1
1 — 3	1
1 — 4	2
2 — 5	1
3 — 5	2
4 — 6	2
5 — 6	3

11. a) Solve the game using L.P.P. method from the following pay off : 9

	Player A		
Player B	2	– 2	3
	– 3	5	– 1

b) Two pairs *A* and *B* match coins if the coins match then *A*-win 1 unit of value. If the coins do not match then *B*-win 1 unit of value. Determine the optimum strategies of the pair and value of the game. 6

12. a) The network given in the figure gives the permissible root and their length in miles from city-1 (node 1) to other cities (node 2 to 5). Find the shortest root and shortest distance from city-1 to city-5 using Dijkstra's algorithm 7

b) A particular item has annual requirement of 3000 unit. The ordering cost is Rs. 100 per order. The cost per unit is Rs. 10. The carrying cost per unit per year is 30% of the unit cost.

i) Find EOQ.

ii) By using better organizational methods the ordering cost per order is brought to Rs. 80 per order, but the same quantity as determined above was ordered. If a new EOQ is found by using the ordered cost as Rs. 80, what would be further savings in the cost ? 8