Roll No. | | | | | | | | | | | | **Total No. of Pages : 04**

Total No. of Questions : 15

MBA (2012 & Onward) (Sem.–3)

APPLIED OPERATIONS RESEARCH

Subject Code : MBA-301

Paper ID : [C1169]

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A contains SIX questions carrying FIVE marks each and students has to attempt any FOUR questions.**
2. **SECTIONS-B consists of FOUR Subsections : Units-I, II, III & IV. Each Subsection contains TWO questions each carrying EIGHT marks each and student has to attempt any ONE question from each Subsection.**
3. **SECTION-C is COMPULSORY and consists of ONE Case Study carrying EIGHT marks.**

SECTION A

1. What is Degeneracy in Transportation problems? How does it arise? How can we deal with this problem?

2. Can there be multiple optimal solutions to an assignment problem? How would you identify if possible, the existence of multiple solutions in the Hungarian assignment method?

3. Why is the critical path of such importance in large projects scheduling and control? Can a critical path change during the course of project? Why?

4. Discuss the basic characteristics of a queuing system.

5. How would you deal with replacement of items that fail completely and suddenly?

6. What do you understand by "zero sum" in the context of game theory? Can there be a non-zero sum game also?

SECTION B

UNIT-I

7. What are the essential characteristics of Operation Research? Discuss the role and scope of quantitative methods for scientific decision making in business management.

8. For the data given in the table below, draw the network. Crash the activities and determine the optimal cost of the project and the optimal duration

Activity	Normal		Crash	
	Duration	Cost	Duration	Cost
1-2	8	1000	6	2000
1-3	4	1500	2	3500
2-4	2	500	1	900
2-5	10	1000	5	4000
3-4	5	1000	1	2000
4-5	3	800	1	1000

Indirect cost is Rs.700 per day.

UNIT-II

9. Solve the following LPP :

Minimize $Z = -x_1 + 2x_2$

Subject to constraints :

$-x_1 + 3x_2 \leq 10$

$x_1 + x_2 \leq 6$

$x_1 - x_2 \leq 2$

where $x_1, x_2 \geq 0$

10. Solve the following transportation problem for minimum cost :

Destination	Origin				Requirements
	A	B	C	D	
1	7	4	3	4	15
2	3	2	7	5	25
3	4	4	3	7	20
4	9	7	5	3	40
Availabilities	12	8	35	25	

UNIT-III

11. What is a "game" in game theory? What are the properties of a game? Explain the "best strategy" on the basis of minimax criterion of optimality.

12. Find the sequence that minimizes the total elapsed time required (T) in completing the following jobs. Each job is processed in the order ABC. Also, calculate T.

Job	1	2	3	4	5	6	7
Machine A	10	8	12	6	9	11	9
Machine B	6	4	6	5	3	4	2
Machine C	8	7	5	9	10	6	5

UNIT-IV

13. Determine the optimum replacement interval of an equipment which costs Rs.5200 and whose resale values and running costs are as follows :

Year	1	2	3	4	5	6	7
Resale Value (Rs.)	3500	2700	1800	1000	850	600	425
Running Cost (Rs.)	600	850	1000	1250	1400	1475	2000

14. The rate of arrival of customers at a public telephone booth follows poison distribution, with average time of 10 minutes between 1 customer and the next. The duration of a phone call is assumed to follow exponential distribution, with mean time of 3 minutes.

    a) What is the probability that a person arriving at the booth will have to wait?

    b) What is the average length of the non empty queues that are formed from time to time?

    c) The Company will install a second booth when it is convinced that the customers would expect waiting for at least 3 minutes for their turn to make a call. By how much time should the flow of customers increase in order to justify a second booth?

SECTION C

15. **Case Study**

Several individuals have set up separate brokerage firms that traded in highly speculative stocks. The brokers operated under a loose financial system that allowed extensive inter-brokerage transactions, including buying, selling, borrowing and lending. For the group of brokers as a whole, the main source of income was the commission they received from sales to outside clients.

Eventually, the risky trading in speculative stocks became unmanageable, and all the brokers declared bankruptcy. At the time the bankruptcy was declared, the financial situation was that all brokers owed money to outside clients and the inter-broker financial entanglements were so complex that almost every broker owed money to every other broker in the group.

The brokers whose assets could pay for their debts were declared solvent. The remaining brokers were referred to a legal body whose purpose was to resolve the debt situations in the best interest of outside clients. Because the assets and receivables of the non-solvent brokers were less than their payables, all debts were prorated. The final effect was a complete liquidation of all the assets of the non-solvent brokers.

In resolving the financial entanglements within the group of non-solvent brokers, it was decided that the transactions would be executed only to satisfy certain legal requirements because, in effect, none of the brokers would be keeping any of the funds owed by others. As such, the legal body requested that the number of inter-broker transactions be reduced to an absolute minimum. This means that if A owed B an amount X, and B owed A an amount Y, the two "loop" transactions were reduced to one whose amount is 1 X – Y 1. this amount would go from A to B if X > Y and from B to A if Y > X. if X = Y, the transaction is completely eliminated. The idea was to be extended to all loop transactions involving any number of brokers.

Questions :

How would you handle this situation? Specifically, you are required to answer two questions.

a) How should the debts be prorated?

b) How should the number of inter-broker transactions be reduced to a minimum?