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**Second Semester MBA Degree Examination, December 2011**  
**Quantitative Techniques for Management**

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FIVE full questions.**  
**2. Statistical table is permitted.**

- 1 a. What do you mean by "operation research"? List the phases of OR. (03 Marks)  
 b. You are given information about cost of performing different jobs by different persons. The job- person marking  $\lambda$  indicates that individual involved cannot perform particular job. Using this information state the optimal assignment of jobs. Also find the cost of optimal assignment. (07 Marks)

Person	Job				
	J <sub>1</sub>	J <sub>2</sub>	J <sub>3</sub>	J <sub>4</sub>	J <sub>5</sub>
P <sub>1</sub>	27	18	$\lambda$	20	21
P <sub>2</sub>	31	24	21	12	17
P <sub>3</sub>	20	17	20	$\lambda$	16
P <sub>4</sub>	22	28	20	16	27

- c. List the assumptions made in solving LPP? Solve the following LPP graphically.

$$\text{Maximize (Z)} = 10x_1 + 15x_2$$

$$\text{Subjected to } 2x_1 + x_2 \leq 26$$

$$2x_1 + 4x_2 \leq 56$$

$$x_1 - x_2 \geq -5$$

$$x_1, x_2 \geq 0.$$

(10 Marks)

- 2 a. List the managerial applications of operations research. (03 Marks)  
 b. Solve the following pay - off matrix using dominance principle and hence obtain the strategies of players. Also find the value of game. (07 Marks)

Strategy of ABC	Strategy of XYZ		
	News paper	Radio	TV
News paper	30	40	-80
Radio	0	15	-20
TV	90	20	50

- c. Discuss in detail the various stages involved in the methodology of operations research.

(10 Marks)

- 3 a. List the differences between PERT and CPM. (03 Marks)  
 b. Writ the dual for the following primal LPP :

$$\text{Minimize (Z)} = 3x_1 - 2x_2 + 4x_3$$

$$\text{Subjected to } 3x_1 + 5x_2 + 4x_3 \geq 7$$

$$6x_1 + 1x_2 + 3x_3 \geq 4$$

$$7x_1 - 2x_2 + x_3 \leq 10$$

$$x_1 - 2x_2 + 5x_3 \geq 3$$

$$4x_1 + 7x_2 - 2x_3 \geq 2$$

$$x_1, x_2, x_3 \geq 0.$$

(07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- c. Solve the following transportation problem using north west corner method. Test the optimality of transportation cost using MODI method and hence obtain optimal transportation cost. (10 Marks)

		Ware house			Supply
		D	E	F	
Plant	A	6	4	1	50
	B	3	8	7	40
	C	4	4	2	60
Demand		20	95	35	150

- 4 a. What do you mean by “degeneracy” in transportation problem? How to over come it to solve problem? (03 Marks)
- b. What are the three time estimates commonly used in PERT analysis? Discuss briefly. Also draw the neat sketch showing the relationship between probability and time estimates. Using beta distribution with three time estimates diagram. (07 Marks)
- c. A small project is composed of seven activities whose time estimates are given below :

Activity (i - j)	Estimated duration (weeks)		
	$t_o$	$t_m$	$t_p$
1 - 2	1	1	7
1 - 3	1	4	7
1 - 4	2	2	8
2 - 5	1	1	1
3 - 5	2	5	14
4 - 6	2	5	8
5 - 6	3	6	15

- i) Draw project network diagram.
- ii) Find the critical path of project and expected length.
- iii) Calculate the variance and standard deviation of the project. (10 Marks)
- 5 a. Draw the neat sketch of general structure of queuing system and mention all the components of it. (03 Marks)
- b. What are the objectives of sequencing the jobs? Also list the assumptions involved in solving the sequencing problems. (07 Marks)
- c. Solve the following game graphically. Clearly mention strategies of players and also the value of game. (10 Marks)

	$b_1$	$b_2$	$b_3$	$b_4$
$a_1$	8	5	-7	9
$a_2$	-6	6	4	-2

- 6 a. What do you mean by optimal strategy and value of game with reference to game theory? (03 Marks)
- b. What are the assumptions involved in poisson exponential single server model? Discuss briefly. (07 Marks)

- c. Solve the problem using Johnson's sequencing method. Find total operation time, idle time and cycle time. (10 Marks)

		Jobs						
Job/machine	1	2	3	4	5	6	7	
Machine - 1	3	8	7	4	9	8	7	
Machine - 2	4	3	2	5	1	4	3	
Machine - 3	6	7	5	11	5	6	12	

- 7 a. List the managerial applications of simulation. (03 Marks)  
 b. Explain the various stages involved in the Monte Carlo simulation. (07 Marks)  
 c. A ware house has only one loading dock manned by three person crew. Trucks arrive at the loading dock at an average rate of 4 trucks per hour and arrivals are poisson distributed. The loading of a truck takes 10 minutes on an average and loading time can be assumed to be exponentially distributed about this average. The operating cost of a truck is Rs.100/hour and the members of the loading crew are paid at a rate of Rs.25/hour. Assuming that the addition of new crew members would reduce loading time to 7.5 minutes, would you advise the truck owner to add another crew of three persons? (10 Marks)
- 8 a. What do you mean by looping and dangling errors in network? Show the errors using simple sketch. (03 Marks)  
 b. What are the advantages of models in operations research? Discuss descriptive model, predictive model and normative model briefly. (07 Marks)  
 c. A company manufactures 30 units/day. The sale of these items depends upon demand which has following distribution :

Sales (units)	Probability
27	0.10
28	0.15
29	0.20
30	0.35
31	0.15
32	0.05

The production cost and sale price of each unit are Rs.40 and Rs.50 respectively. Any unsold product is to be disposed off at a loss of Rs.15/unit. There is a penalty of Rs.5/unit if demand is not met. Using the following random numbers, simulate the total profit/loss for the company.

10, 99, 65, 99, 95, 01, 79, 11, 16, 20.

If the company decides to produce 29 units per day, what is the advantage or disadvantage of the company? (10 Marks)

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