61489

Name : .....

Reg. No: .....

SIXTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2010
(09 Scheme)

Regular/Supple/Improvement

ME 09 604 - OPERATIONS RESEARCH

Time : Three Hours **Maximum : 70 Marks**

Part A
Answer all questions

1. Mention two advantages and limitations of operations research.
2. State the assumptions of LPP.
3. What is the difference between slack and surplus variables?
4. How will you distinguish equality and inequality constrains in transportation problem?
5. What is meant by saddle point in game theory?

(5 x 2 = 10 Marks)

Part B
Answer any four questions

6. Explain the exceptional cases encountered during simplex iterations in LPP.
7. Prove that the LP problem given below is an example for degeneracy.

   Maximize $Z = x_1 + x_2 + x_3$

   Subjected to $x_1 + x_2 \leq 1$

   $x_2 + x_3 \leq 0$

   $x_1, x_2, x_3 \geq 0$

8. An R&D manager must assign four teams to four projects. The manager has assessed the expected long term profit from each project from each group that might be assigned. Using profit data given in the below table, find the optimal assignment of teams to projects.

Team	Project			
A	25	12.5	6	1.5
B	15	8	7	1.5
C	5	3	1.5	0
D	15	5	5	2

9. Explain the major steps involved in U-V method for optimizing the basic feasible solution in TP problems.
10. Solve the following payoff matrix, which represents player's gain.

Turn over

		Player B			
		B1	B2	B3	B4
Player A	A1	8	2	9	5
	A2	6	5	7	18
	A3	7	3	-4	10

11. Explain first- in- first serve system with an example.

(4 x 5 = 20 Marks)

Part C

Answer all questions

12. (a) The Xeon Company owns a small paint factory that produces both interior and exterior house paints for wholesale distribution. Two basic raw materials, A and B, are used to manufacture the paints. The maximum availability of A is 6 tons a day and that of B is 8 tons a day. The daily requirements of the raw materials per ton of interior and exterior paints are summarized in the following table:

Raw Material	Tons of raw material per ton of paint	
	Exterior	Interior
A	1	2
B	2	1

A market survey has established that the daily demand for interior paint cannot exceed that of exterior paint by more than one ton. The survey also shows that the maximum demand for interior paint is limited to 2 tons daily. The wholesale price per ton is Rs.3000 for exterior paint and Rs.2000 for interior paint. Use graphical method to determine number of units of interior and exterior paints should the company produce daily to maximize gross income.

OR

(b) A firm can produce three types of cloths A, B and C. Three kinds of wool are required such as Red, Green and Blue. One' unit of length of type A cloth needs 2 meters of red wool and 3 meters of blue wool. One unit of length of type B cloth needs 3 meters of red wool, 2 meters of green wool and 2 meters of blue wool. One unit type of C cloth needs 5 meters of green wool and 4 meters of blue wool. The firm has a stock of 8 meters of red, 10 meters of green and 15 meters of blue. It is assumed that the income obtained from one unit of type A is Rs.3, from B is Rs.5 and from C is Rs.4.

i. Formulate this as an LPP

ii. Write down the associate duality problem.

iii. Use dual simplex algorithm to determine the quantity of each type of cloth.

13. (a) Solve the following LP problem using Simplex method.

Maximize $Z = 3x_1 + 2x_2 + 4x_3$

Subject to $2x_1 + 3x_2 + x_3 \leq 30$

$x_1 + x_2 + 3x_3 \leq 30$

$x_1 + 3x_2 + x_3 \leq 24$

$x_1, x_2, x_3 \geq 0$

OR

(b) Using slack, surplus and artificial variables, solve the following LP problem:

Maximize $Z = 6x_1 + 4x_2$

Subject to $2x_1 + 3x_2 \leq 30$

$3x_1 + 2x_2 \leq 24$

$x_1 + x_2 \leq 3$

$x_1, x_2 \geq 0$

14. (a) Find an optimum solution to the following transportation problem with unit transportation cost.

	Warehouse					
Factory		W1	W2	W3	W4		Factory capacity
	F1	19	30	50	10	7	
	F2	70	30	40	60	9	
	F3	40	8	70	20	18	
		5	8	7	14		
	Warehouse requirements						

OR

(b) Explain the following with illustrative examples:

i. Balanced and Unbalanced transportation problems.

ii. Degeneration in transportation problem.

15. (a) Arrival rate of telephone calls at a telephone booth are according to Poisson distribution, with an average time of 9 minutes between two consecutive arrivals. The length of telephone call is assumed to be exponentially distributed, with mean 3 minutes. (i) Determine the probability that a person arriving at the booth will have to wait. (ii) Find the average queue length. (iii) Find the average time a customer spends in the system. (iv) Find the average number of customers in the system. (v) What is the probability that an arrival will have to wait for more than 10 minutes before the phone is free. (vi) The telephone company will install a second booth when convinced that an arrival would expect to have to wait at least four minutes for phone. Find the rate of arrival which will justify a second booth.

OR

(b) In 18th century, when transportation systems were not developed, a family wanted to travel to reach a friend's house in other part of the country. But they had a choice of various routes and haltages in between from their home to final destination. Cost of travel from each point to the other points en route, based on relevant factors such as distance, difficulties, mode of transportation are given below:

	B	C	C
A	2	4	3

	E	F	G
B	7	4	6
C	3	2	4
D	4	1	5

	H	I
E	1	4
F	6	3
G	3	3

	J
H	3
I	4

Use dynamic programming to find the safest route of travelling so that the total travelling cost becomes minimum.

(4 x 10 = 40 Marks)

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