

Code: ME6T3

III B.Tech - II Semester – Regular Examinations – May 2017

**OPERATIONS RESEARCH
(MECHANICAL ENGINEERING)**

Duration: 3 hours

Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

11x 2 = 22 M

1.

- a) Write the phases in building operations research model.
- b) How would you identify degeneracy in simplex table?
- c) How do you resolve degeneracy in transportation problem, if number of occupied (basic) cells is one less than $m+n-1$ in initial solution?
- d) What is the optimality condition for assignment problem?
- e) State Johnson's extension rule to sequence n jobs through three machines.
- f) Define economic life of equipment.
- g) What is two-person zero-sum game?
- h) Define utilization factor in queuing theory.
- i) What is economic order quantity?
- j) Write any two applications of dynamic programming.
- k) Write any two limitations of simulation languages.

PART – B

Answer any *THREE* questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) Solve the following LP problem using simplex method.

$$\text{Maximize, } Z = x_1 + x_2 + 3x_3$$

Subjected to

$$3x_1 + 2x_2 + x_3 \leq 3$$

$$2x_1 + x_2 + 2x_3 \leq 2$$

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

8 M

b) The standard weight of a special purpose brick is 5 kg and it contains two basic ingredients clay and sand. Clay costs Rs. 5 per kg and Sand costs Rs. 8 per kg. Strength considerations state that the brick contains not more than 4kg of clay and minimum of 2kg of sand. Since the demand for the product is likely to be related to the price of the brick, find out graphically minimum cost of the brick by satisfying the above conditions. 8 M

3. a) A steel company has three LD furnaces and five medium merchant rolling mills. Transportation cost (Rs per ton) for shipping steel from furnaces to rolling mills is shown in the following table.

	Mill 1	Mill 2	Mill 3	Mill 4	Mill 5	Capacities (tons)
Furnace 1	4	2	3	2	6	8
Furnace 2	5	4	5	2	1	12
Furnace 3	6	5	4	7	3	14
Requirement (tons)	4	4	6	8	8	

What is the optimal shipping schedule? 12 M

b) Describe traveling sales man problem. 4 M

4. a) Discuss the reasons to replace a equipment. 6 M

b) Solve the following 3 X 5 game using dominance property. 10 M

		Player B				
		1	2	3	4	5
Player A	1	2	5	10	7	2
	2	3	3	6	6	4
	3	4	4	8	12	1

5. a) What is Kendall notation? Explain each term it consists. 6 M

b) Annual demand for an item is 6000 units. Ordering cost is Rs. 600 per order. Inventory carrying cost is 18% of the purchase price/unit/year. The price breakups are shown below. Find the optimal order size. 10 M

Quantity	Price (in Rs.) per unit
$0 \leq Q_1 < 2000$	20
$2000 \leq Q_2 < 4000$	15
$4000 \leq Q_3$	9

6. a) Describe Bellman's principle of optimality. 4 M

b) Demonstrate Monte Carlo simulation with suitable example. 12 M