Code: 9A03701

B.Tech IV Year I Semester (R09) Supplementary Examinations, May 2013
OPERATIONS RESEARCH
(Mechanical Engineering)

Time: 3 hours   Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1   Solve the following LP problem using big-M method:

Minimize $Z = 2x_1 + 9x_2 + x_3$

Subject to $x_1 + 4x_2 + 2x_3 \geq 5;$

$3x_1 + x_2 + 2x_3 \geq 4;$

$x_1,\ x_2 \geq 0.$

2   Find the optimal solution for the following transportation problem. The cell entries represent the unit transportation cost in rupees from each source to each destination.

From			To			Supply
3	4	6	8	9		20
2	10	1	5	8		30
7	11	20	40	3		15
2	1	9	14	16		13
Demand	40	6	8	18	6	

3   A manufacturer, finds from his past records that the costs per year associated with a machine with a purchase price of Rs.50,000 are as given below:

Year	1	2	3	4	5	6	7	8
Maintenance (Rs.)	15000	16000	18000	21000	25000	29000	34000	40000
Scrap value in Rs.	35000	25000	17000	12000	10000	5000	4000	4000

Determine the optimum replacement policy.

4   Solve the following game by graphical method:

		Player B				
		1	2	3	4	5
Player A	1	-5	5	0	-1	8
	2	8	-4	-1	6	-5

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5   An insurance company has 3 claims adjusters in their main office. Customers are found to arrive in Poisson manner at a rate of 5 per hour for settling claims against the company. The service time is found to have exponential distribution with a mean of 25 minutes. Claimants are processed on first come first served basis. Calculate:

(a) The average number of customers in the system.
(b) The average time a customer spends in the system.
(c) The average queue length.
(d) The average waiting time for customers.

6   Find the optimum order quantity for a product for which the price breaks are as follows:

Quantity (units)	Unit cost (Rs.)
$0 < q < 650$	20
$650 \leq q < 800$	18.50
$800 \leq q$	17.50

The monthly demand for the product is 300 units, the cost of carrying inventory is 2% of the unit price of the item and the cost of ordering is Rs.400.

7   Solve the following LP problem by dynamic programming:

$$\text{Maximize} \quad f(x_1, x_2) = 4x_1 + 14x_2;$$
$$\text{Subject to} \quad 2x_1 + 7x_2 \leq 21;$$
$$7x_1 + 2x_2 \leq 21;$$
$$x_1 \geq 0, x_2 \geq 0$$

8 (a) Define simulation. Explain various types of simulation.
  (b) Explain briefly about simulation languages.

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