

**II B.Tech II Semester Supplementary Examinations, April/May 2005**  
**OPERATIONS RESEARCH**  
**(Information Technology)**

Time: 3 hours

Max Marks: 70

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. Solve the following LPP by simplex method.

$$\text{Maximize } Z = 2x_1 + x_2 + x_3$$

Subject to :

$$4x_1 + 6x_2 + 3x_3 \leq 8$$

$$3x_1 - 6x_2 - 4x_3 \leq 1$$

$$2x_1 + 3x_2 - 5x_3 \leq 4$$

$$x_1, x_2 \text{ and } x_3 \geq 0$$

2. A Securable Sales Group wishes to purchase the following quantities of uniforms:

Uniform type :	A	B	C	D	E
Quantity:	150	100	75	250	200

Tenders are submitted by four different manufacturers who undertake to supply not more than the quantities indicated below.

Manufacturers:	P	Q	R	S
Total uniform quantity:	300	250	150	200

The group estimates that its profit (in Rs. ) per uniform will vary with the manufacturer as shown in the following table :

	A	B	C	D	E
P	27.50	35.00	42.50	22.50	15.00
Q	30.00	32.50	45.00	17.50	10.00
R	25.00	35.00	47.50	20.00	12.50
S	32.50	27.50	40.00	250.00	17.50

How should the orders for uniforms be placed.

3. (a) What is the difference between a assignment problem and a traveling salesmen problem?
- (b) Solve the following assignment problem. The elements given in the matrix are the profits in Rs. derived for such a assignment.

		Machines			
		P	Q	R	S
Jobs	A	51	53	54	50
	B	47	50	48	50
	C	49	50	60	61
	D	63	64	60	60

4. A large hospital complex has several operation theaters. Each operation table has a special light bulb attachments. The bulb is prone to failure. There are 200 bulbs installed in all. Considering 500 hours as period, the failure of similar bulb has been as under: Out of 100 bulbs;

9 failed by the end of first period  
 20 failed by the end of second period  
 33 failed by the end of third period  
 61 failed by the end of fourth period  
 77 failed by the end of fifth period  
 90 failed by the end of sixth period  
 100 failed by the end of seventh period

The management considers to make it a practice to replace all in a group at one time, then replace the individual bulb as and when it fails and after fixed interval of time again replace entire group of 200 bulbs. If the bulbs are replaced in group it costs Rs.5 per bulb and when replaced individually it costs Rs.20 per bulb. What should be the replacement policy of the hospital?

5. (a) For the following pay-off matrix, determine the best strategies and the value of the game

		Y		
		j	k	l
X	p	60	50	40
	q	70	70	40
	r	80	60	75

- (b) Briefly explain the limitations of game theory.
6. An oil company is constructing a service station on a high way. Traffic analysis indicated that customers arrivals over most of the day would approximate a Poisson distribution with a mean of 40 automobiles per hour. Previous studies show that one pump could service a mean of 12 automobiles per hour, with the service time distribution approximating the negative exponential. If 5 pumps are installed,
- what is the probability that an arrival would have to wait in line?
  - find out the average waiting time, average time spent in the system and the average number of automobiles in the system ?
  - for what percentage of time would a pump be idle on an average ?
7. (a) The Paintwell paint ltd. would like to improve its inventory facilities for its supply of paints used for automobiles. Annual demand for the paint is 50,000 litres and the paint costs Rs.20 per litre and is used at a constant rate. Annual carrying cost is 15% of the value of the paint held. Each order costs Rs.80. Determine:
- How much paint should be ordered each time?

- ii. How often should paint be ordered
  - iii. Time between two consecutive orders.
- (b) Mention the characteristics of inventory system.
8. Maximize hydroelectric power  $P(s) = (S_1, S_2, S_3)$  produced by building dams on three different river basins where  $P(s) = f_1(S_1) + f_2(S_2) + f_3(S_3)$  and  $f_i(S_i)$  is the power generated from the  $i_{th}$  basin by investing rupees  $S_i$ . The total budgetary provision is  $S_1 + S_2 + S_3 \leq 3$ . The function  $f_1, f_2$  and  $f_3$  are given in the following table. Integer solution of the problem is required.

$S_i$	0	1	2	3
$F_1$	0	2	4	6
$F_2$	0	1	5	6
$F_3$	0	3	5	6

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