

**III B.Tech I Semester Supplementary Examinations, May 2005**  
**OPERATIONS RESEARCH**  
**( Common to Computer Science & Engineering and Electronics & Computer Engineering)**

Time: 3 hours

Max Marks: 80

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

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1. (a) What are the major assumptions in a Linear Programming model?  
 (b) Discuss in brief Duality in linear programming
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 Company has four territories open and four salesman available for assignment. The territories are not equally rich in their sales potential, it is essential that a typical salesman operating in each territory would bring in the following annual sales :

Territory I : Rs. 60,000

Territory II : Rs. 50,000

Territory III : Rs. 40,000

Territory IV : Rs. 30,000

The four salesmen are also considered to differ in ability; it is estimated that, working under the same conditions, their yearly sales would be proportionately as follows :

Salesman A : 7 ; Salesman B : 5 ; Salesman C : 5 ; Salesman D : 4

If the criterion is maximum expected total sales, the intuitive answer is to assign the best salesman to the richest territory, the next best salesman to the second richest territory and so on. Verify this answer by the assignment method.

4. (a) Briefly explain the reasons for replacement.  
 (b) The following table gives the running costs /year and resale price of equipment whose purchase price is Rs.8000.

Year	1	2	3	4	5	6	7	8
Running Cost(Rs.)	2500	2600	2800	3100	3500	3900	4400	5400
Resale Value(Rs.)	6500	5500	4700	4200	3800	3500	3500	3500

- i. At what year is replacement due?  
 ii. If the resale value is zero, will there be any change in the replacement policy?
5. (a) Briefly explain the properties found in competitive games  
 (b) Reduce the following game by dominance and find the game value:

		Player B			
		I	II	III	IV
Player A	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

6. A computer shop has a laser printer. The jobs for laser printing are randomly distributed approximating a Poisson distribution with mean service rate of 10 jobs per hour, since job pages vary in length (pages to be printed). The jobs arrive at a rate of 6 per hour during the entire 8 hours workday. If the laser printer is valued Rs.30/- per hour, determine
- (a) The percent time an arriving job has to wait  
 (b) Average system time  
 (c) Average idle time cost of the printer per day.
7. (a) Explain in detail what constitutes ordering cost and carrying cost. With help of graph, show how they behave with increase in order quantity.  
 (b) A dealer supplies the following information with regards to a product is dealing with:
- Annual demand: 10,000 units  
 Ordering cost: Rs 10 per order  
 Inventory carrying cost: 20% of the unit value of the item  
 Price per unit: Rs 20  
 Determine economic order quantity.
8. (a) What are the characteristics of dynamic programming problem.  
 (b) Set up the recursive relation using dynamic programming approach when an N stage objective function is to be maximized.

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