

IV B.Tech II Semester Supplementary Examinations, Apr/May 2006
OPERATIONS RESEARCH
(Chemical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

- Write an essay on Scope, Methodology and Phases of Operations Research. [16]
- A firm manufactures three products A, B, and C. Each product is to be processed on three machines X, Y, and Z. The following table gives the processing times in hours and the machine availability and the net profit per unit in Rupees of each product.

Product	Processing time in hours per unit Machines.			Profit per unit in Rupees
	X	Y	Z	
A	3	2	1	2/-
B	4	1	3	4/-
C	2	2	3	2.50
Machine Availability In hours.	60	40	30	

Formulate the mathematical model of the problem and solve by first simplex method. [16]

- Explain the concept Johnson Bekman Rule.
 - Find the sequence that minimizes the total elapsed time required to complete the following jobs.

Job No	1	2	3	4	5	6
Machine A	3	5	4	2	2	1
Machine B	2	8	1	6	3	5

[6+10]

- The following failure rates have been observed for a certain type of light bulbs:

End of week :	1	2	3	4	5	6	7	8
Probability of failure to date :	0.05	0.13	0.25	0.43	0.68	0.88	0.96	1.00

The total no. of bulbs are 1000. The cost of replacing an individual bulb is Rs 1.25 . The decision is made to replace all bulbs simultaneously at fixed intervals and also to replace individual bulbs as they fail in service. If the cost of group replacement is 30 paise per bulb. What is the best interval between group replacements? [16]

- List the characteristics of competitive games. [4]
 - Two companies A and B are competing for the same product. Their different strategies are given in the following pay off matrix. [12]

		Company A		
		A1	A2	A3
Company B	B1	2	-2	3
	B2	-3	5	-1

What are the best strategies for both the companies? Find out the value of the Game.

6. The probabilities P_n of n customers in the system for $(M/M/1)=(GD/5/\infty)$ are given

n	0	1	2	3	4	5
P_n	0.399	0.249	0.156	0.097	0.061	0.038

The arrival rate λ is 5 customers/hour. The service rate μ is 8 customers/hour.

- Compute the probability that an arriving customer will be able to enter the system.
 - Compute the rate at which the arriving customer will not be able to enter the system.
 - Compute the expected no. in the system.
 - Compute the average waiting time in the queue. [16]
7. (a) Perform ABC analysis on the following sample of items in the inventory. [10]

Item	Annual Consumption	Price / Unit in paise
A	300	10
B	2800	15
C	30	10
D	1100	5
E	40	5
F	220	100
G	1500	5
H	800	15
I	800	5
J	80	10

- Explain VED analysis? [6]
8. Six units of capital can be invested in three plants. Only an integer number of units can be allocated. The expected discounted return from each plant is given below. The objective is to maximize the over all expected return. [16]

Amount allocated	Expected return		
	Plant A	Plant B	Plant C
0	0	0	0
1	1	2	1
2	3	2	2
3	3	4	3
4	4	5	5
5	6	6	8
6	8	7	9

Use dynamic programming to obtain

- (a) the best allocation
- (b) the best allocation if only four units of capital are available.
- (c) the best allocation if $X_A \geq 2$. (X_A = number of units allocated to plant A),
- (d) the best allocation if $X_C \leq ?$
