

OPERATIONS RESEARCH

(For 2009, 2010, 2011 & 2012 admitted batches only)

Time: 3 hours

Max. Marks: 60

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Explain briefly the applications of operation research.
(b) Solve graphically the following LPP
Maximize $z = 3x_1 + 2x_2$
Subject to the constraints $-2x_1 + x_2 \leq 1$,
 $x_1 \leq 2$
 $x_2 + x_2 \leq 3$
 $x_1, x_2 \geq 0$
- (c) Use Big M method to maximize $z = 2x_1 + x_2 + 3x_3$ subject to the constraints $x_1 + x_2 + 2x_3 \leq 5$, $2x_1 + 3x_2 + 4x_3 = 12$; $x_1, x_2, x_3 \geq 0$.
- 2 (a) Obtain the dual problem of the primal problem:
Minimize $z = x_1 - 3x_2 - 2x_3$ subject to the constraints $3x_1 - x_2 + 2x_3 \leq 7$, $2x_1 - 4x_2 \geq 12$,
 $-4x_1 + 3x_2 + 8x_3 = 10$; $x_1, x_2 \geq 0$ and x_3 is unrestricted.
(b) Use dual simplex method to solve the LPP.
Minimize $z = 2x_1 + 3x_3$ subject to the constraints $2x_1 - x_2 - x_3 \geq 3$, $x_1 - x_2 + x_3 \geq 2$;
 $x_1, x_2, x_3 \geq 0$.
- 3 (a) What is a balanced transportation problem? What are its applications?
(b) Solve the following travelling salesman problem so as to minimize the cost per cycle

		To				
		1	2	3	4	5
From	City 1	∞	10	25	25	10
	City 2	1	∞	10	15	2
	City 3	8	9	∞	20	10
	City 4	14	10	24	∞	15
	City 5	10	8	25	27	∞

- 4 (a) A company has 6 jobs on hand. Each of these must be processed through two departments J I and J II. The time required for the jobs on each department in hours is given below.

	A	B	C	D	E	F
J I	1	4	6	3	5	2
J II	3	6	8	8	1	5

Draw a sequence table scheduling the six jobs on the two departments.

- (b) A machine shop has four machines A, B, C, D. Two jobs must be processed through each of these machines. The time (in hours) taken on each of the machines and the necessary sequence of jobs through the shop are given below.

Job 1	{	Sequence	A	B	C	D
	{	Time	2	4	5	1
Job 2	{	Sequence	D	B	A	C
	{	Time	6	4	2	3

Use graphic method to obtain the total minimum elapsed time.

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- 5 (a) A truck with first cost of Rs.80,000 has the depreciation and service pattern shown below;

Year	:	1	2	3	4	5	6
Depreciation during year	:	28000	20000	14000	5000	4000	4000
Annual service cost	:	18000	21000	25000	29000	34000	40000

Assume no interest charges are necessary for the evaluation. How many years should the truck be kept in service before replacement?

- (b) Let the value of money be assumed to be 10% per year and suppose that machine A is replaced after every 3 years where as machine B is replaced after every six years. The yearly costs of both the machines are given below.

Year	:	1	2	3	4	5	6
Machine A	:	1000	200	400	1000	200	400
Machine B	:	1700	100	200	300	400	500

Determine which machine should be purchased.

- 6 (a) Use dynamic programming to find the value of maximum $z = y_1 \cdot y_2 \cdot y_3$ subject to the constraints $y_1 + y_2 + y_3 = 5$; $y_1, y_2, y_3 \geq 0$.
- (b) What is dynamic programming? Explain the advantages and disadvantages of dynamic programming.
- 7 (a) Describe a two-person zero-sum game.
- (b) Solve the following game after reducing it to 2×2 game.

$$\text{Player A} \begin{pmatrix} & \text{Player B} \\ & 1 & 7 & 2 \\ 6 & 2 & 7 \\ 5 & 1 & 6 \end{pmatrix}$$

- 8 (a) Enumerate the various types of inventory models.
- (b) The production department of a company requires 3,600 kg of raw material for manufacturing a particular item per year. It has been estimated that the cost of placing an order is Rs.36 and the cost of carrying inventory is 25 percent of the investment in the inventories. The price is Rs.10 per kg. Determine an ordering policy for raw material with the help of purchase manager.
