

Assignment

Q1. What is Operational Research? Discuss the limitation of operational Research.

Ans

Operational Research :-

Operational research (OR) encompasses the development & the use of a wide range of problem-solving techniques & methods applied in pursuit of improved decision-making and efficiency, such as simulation, mathematical optimization, queuing theory and other stochastic-process models, Markov decision processes. Operations Research is an analytical method of problem-solving and decision-making that is useful in the management of organizations. In 'OR', problems are broken down into basic components & then solved in defined steps by mathematical analysis.

Limitations of Operational Research :-

① Dependence on an Electronic Computer :-

O.R. techniques try to find an optimal solution taking into account all the factors. In the modern society, these factors are enormous &

expressing them in quantity and establishing relationships among as these require voluminous calculations that can only be handled by computers.

② Non-Quantifiable Factors :- O.R. techniques provide

a solution only when all the elements related to a problem can be qualified. All relevant variables do not lend themselves to quantifications, factors that cannot be quantified find no place in O.R. models.

③ Distance between Manager and Operations Researcher :-

O.R. being specialist's job requires a mathematician or a statistician, who might not be aware of business problems. Similarly, a manager fails to understand the complex working of O.R. Thus, there is a gap between the two.

④ Money and Time Costs :-

When the basic data are subjected to frequent changes, incorporating them into the O.R. models is a costly affair. Moreover, a fairly

good solution at present may be more desirable than a perfect O.R. solution available after sometime.

(5) Implementation:- Implementation of decisions is a delicate task. It must take into account the complexities of human relations & behaviour.

Q2

$$Z(\min) = X_1 + X_2$$

Subject to:-

$$2X_1 + 4X_2 \geq 4$$

$$X_1 + 7X_2 \geq 7$$

$$X_1, X_2 \geq 0$$

Soln:

$$(1) \quad Z(\min) = X_1 + X_2$$

$$(2) \quad 2X_1 + 4X_2 \geq 4 \quad \text{--- (1)}$$

$$X_1 + 7X_2 \geq 7 \quad \text{--- (2)}$$

(3) ~~Introducing~~ Introducing Surplus & Artificial variable,

$$2X_1 + 4X_2 - S_1 + A_1 = 4$$

$$X_1 + 7X_2 - S_2 + A_2 = 7$$

(4)

$$Z(\min) \Rightarrow X_1 + X_2 - 0.5S_1 - 0.25S_2 + mA_1 + mA_2$$

(5) putting all surplus & Decision variable to 'zero'.

$$A_1 = 4$$

$$A_2 = 7$$

(6) Initial simplex table:-

		1	1	0	0	m	m		
	C_j	x_1	x_2	s_1	s_2	A_1	A_2	b	θ
m	A_1	2	4	-1	0	1	0	4	(1)
m	A_2	1	7	0	-1	0	1	7	1
	Z_j	$2m+m$	$4m+7m$	$-m$	$-m$	m	m		
		$3m$	$11m$	$-m$	$-m$	m	m		
	$Z_j - C_j$	$3m-1$	$11m-1$	$-m$	$-m$	0	0		

∴,

incoming variable $\Rightarrow x_2$

outgoing variable $\Rightarrow A_1$

now second simplex table:-

	C_j	1	1	0	0		m		
		X_1	X_2	S_1	S_2	X_3	A_2	b	θ
1	X_2	1/2	1	-1/4	0		0	1	
m	A_2	-5/2	0	7/4	-1		1	0	
	Z_j	$\frac{-5m-1}{2}$	1	$\frac{7m-1}{4}$	-m		m		
	$Z_j - C_j$	$\frac{-5m-1}{2}$	0	$\frac{-1+7m}{4}$	-m		0		

so

$$X_2 = 1, X_1 = 0$$

so,

$$Z(\min) \Rightarrow X_1 + X_2$$

$$\Rightarrow 0 + 1$$

$$\boxed{Z(\min) \Rightarrow 1}$$

(Ans)