SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai — 600 044.
B.Com.(PA) END SEMESTER EXAMINATIONS APRIL-2023
SEMESTER - VI
19UPACT6018 - Operations Research

Total Duration : 2 Hrs. 30 Mins. Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. State and explain characteristics of operation research.
2. Briefly mention the various phases of operation research.
3. What are the advantages and limitations of LP models?
4. A company manufactures three types of product which use precious metal, platinum and gold due to the shortage of these metal, the government regulates the amount that may be used per day. The relevant data with respect to supply, requirements and profits are summarized in the table below.

Product	**Platinum Required / Units (gms)**	**Gold Required / Units (gms)**	**Profits / Units (Rs.)**
A	2	3	500
B	4	2	600
C	6	4	1,200

Daily allotment of platinum and gold is 160 gms and 120 gms respectively. How should the company divide the supply of scarce precious metals? Formulate the mathematical model.

5. Solve the following problem using simplex method.
Maximize Z = $21x_1$+$15x_2$
Subject to the constraints $-x_1$-$2x_2 \geq$-6
6. Solve the following transportation problem

	A	B	C	a_i
F_1	10	9	8	8
F_2	10	7	10	7
F_3	11	9	7	9
F_4	12	14	10	4
b_j	10	10	8	

Contd...

7. Explain the maximin principle with the following pay-off matrix for player A.

$$\begin{array}{c} \\ \text{Player A} \end{array} \begin{array}{c} \text{Player B} \\ \begin{bmatrix} 20 & 12 & 15 \\ 11 & 10 & 12 \\ 15 & 11 & 10 \end{bmatrix} \end{array}$$

8. Solve the following game

$$\begin{array}{c} \\ \text{Player A} \end{array} \begin{array}{c} \text{Player B} \\ \begin{bmatrix} 12 & 1 & 30 & -10 \\ 20 & 3 & 10 & 5 \\ -5 & -2 & 25 & 0 \\ 15 & -4 & 10 & 6 \end{bmatrix} \end{array}$$

Section C

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. Discuss the importance of mathematical models by giving examples in the solution of OR problems.

10. A mutual fund company has Rs.20 Lakhs available for investment in government bonds, blue chips stocks, speculative stocks and short-term bank deposits. The annual expected return and risk factor are given below

Type of investment	**Annual expected return (%)**	**Risk factor (0 to 100)**
Government bond	14	12
Blue chip stock	19	24
Speculative stock	23	48
Short term deposits	12	6

Mutual fund is required to keep at least Rs.2 lakhs in short term deposits and not to exceed an average risk factors of 42. Speculative stocks must be almost 20 percent of total amount invested. How should mutual fund invest the fund so as to maxims its total expected annual return? Formulate this as a linear programming problem. Do not solve it.

11. A company produces three products A, B and C. These products require three ores O_1, O_2 and O_3. The maximum quantities of the ores O_1, O_2 and O_3 available are 22 tonnes, 14 tonnes and 14 tonnes respectively. For one tonne of each of these products ore requirements are:

Product	**O_1**	**O_2**	**O_3**	**Profit per tonne (in Rs.'000)**
A	3	1	3	1
B	-	2	2	4
C	3	3	0	5

How many tonnes of A,B and C should the company produce to maximize profit? Formulate as LPP.

12. Solve the following transportation problem whose cost matrix, availability at each plant and requirements at each ware house are given as follows.

Plant	Ware House				Availabilty
	W1	W_2	W_3	W_4	
P_1	190	300	500	100	70
P_2	700	300	400	600	90
P_3	400	100	600	200	180
Requirements	50	80	70	140	340

13. Solve the following game

	B		
A	1	-1	3
	3	5	-3
	6	2	-2

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