Capital Rationing - 20 CONSTRAINTS

Sl. No.	Description	Solver Setup	Logic
1	Binary Constraint	D2:D11 = binary	Ensures projects are either selected (1) or not (0).
2	Budget Constraint	B12 ≤ B13	Ensures total project cost stays within the budget.
3	Mutually Exclusive Projects (A & B)	D2 + D3 ≤ 1	Ensures only one of Projects A and B is selected.
4	Dependent Selection (D → E)	D5 ≤ D6	If Project D is selected, Project E must also be selected.
5	Mandatory Project (F)	D7 = 1	Ensures Project F is selected due to strategic importance.
6	Minimum Project Count	SUM(D2:D11) ≥ 5	Guarantees that at least 5 projects are selected.
7	Maximum Project Count	SUM(D2:D11) ≤ 7	Limits the number of selected projects to 7.
8	Mutual Inclusion (G & H)	D8 ≤ D9	If Project G is selected, Project H must also be selected.
9	High NPV Prioritization	For high NPV projects: D4 = 1	Ensures high NPV projects (e.g., above ₹100,000) are included.
10	Group Inclusion (A, B, C)	D2 + D3 + D4 ≥ 1	Ensures at least one project from the group (A, B, C) is selected.
11	Exclusion of Low-Value Projects	For low NPV projects: D6 = 0	Prevents selection of projects with NPV below a certain threshold (e.g., ₹50,000).

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12	Maximum Cost per Project	D2 * B2 ≤ 1,500,000 (repeat for each project)	Ensures no single project exceeds a defined cost threshold.
13	Specific Project Pairing (A → C)	D2 ≤ D4	If Project A is selected, Project C must also be selected, but not vice versa.
14	Balanced Cost Distribution	SUMPRODUCT(B2:B4, D2:D4) ≤ 2,500,000	Limits the total cost of a specific group of projects (e.g., A, B, C) to ₹2,500,000.
15	Minimum NPV Threshold	For each project: D2 * C2 ≥ 100,000	Ensures only projects with NPV ≥ ₹100,000 are selected.
16	Proportional Selection of High-Cost Projects	SUMIF(B2:B11, ">1000000", D2:D11) ≥ 2	Ensures at least 2 high-cost projects (cost > ₹1,000,000) are selected.
17	Exclusion of Conflicting Projects (E & F)	D6 + D7 ≤ 1	Ensures only one of the conflicting projects (E or F) is selected.
18	Group Prioritization (50% Cost for A, C, F)	SUMPRODUCT(B2:B11, D2:D11) * 0.5 ≤ SUMPRODUCT(B2:B11, {1,0,1,0,0,1,0,0,0,0})	Ensures selected projects from specific groups contribute at least 50% of the total cost.
19	Limiting Risk (High-Risk Projects D, E, G)	SUMPRODUCT(B5:B9, D5:D9) ≤ 0.3 * B13	Ensures no more than 30% of the total budget is spent on high-risk projects.
20	Portfolio NPV-to-Cost Ratio	SUMPRODUCT(C2:C11, D2:D11) / SUMPRODUCT(B2:B11, D2:D11) ≥ 0.2	Guarantees a minimum return (NPV) relative to cost.