IE 203 PS 3

2026-02-26

Q1. Project Selection via Branch-and-Bound

A company has a capital budget of **$20 million** for the upcoming fiscal year. The portfolio management team has identified **5 candidate projects**. Each project generates an expected total revenue if selected and requires a one-time investment. A project is either fully undertaken ($x_i = 1$) or not undertaken ($x_i = 0$).

Project	**Description**	**Revenue r_i ($M)**	**Cost c_i ($M)**
P_1	Factory Expansion	25	14
P_2	Software Platform	16	2
P_3	Logistics Hub	16	9
P_4	Regional Office	20	8
P_5	Marketing Campaign	9	4

Table 1: Candidate projects with expected revenues and costs.

a) Formulate this problem as a **0–1 Integer Programming** model that maximises total profit subject to the budget constraint.

b) Solve the model using the **Branch-and-Bound** (B&B) algorithm.