DEPARTMENT OF MATHEMATICS
Indian Institute of Technology, Guwahati

Quiz 2 | MA321
01-11-2021 | Instructor : Sukanta Pati
Time : 16.10am–19.10pm | Maximum Score : 20

Write appropriate and precise justifications, with readable handwriting. Use pencils for convenience. Submit a single pdf (rollnumber.pdf) to my email pati@iitg.ac.in by 19.20pm.

1. (Profit maximizing)

   A company has four factories and four outlets. The factories (F_1, F_2, F_3, F_4) produce $60, 70, 80, 90$ units (of some goods) in a month, respectively. The demands at outlets (O_1, O_2, O_3, O_4) is $70, 50, 80, 60$. For each unit of goods sent from factory F_i to outlet O_j the profit made by the company is the (i, j)th entry of the matrix P given below.

$$P = \begin{bmatrix} 3 & 2 & 3 & 2 \\ 2 & 4 & 1 & 2 \\ 4 & 3 & 3 & 4 \\ 1 & 1 & 2 & 1 \end{bmatrix}$$

   The company has to transport all the goods from the factories to the outlets while meeting the demands. The company wants to maximize its profit.

   a) Make an appropriate reduction to one of our known problems. (Justification required.) [4]

   b) Solve it. [4]

2. There are three men who can do any of the six jobs. The time (in days) taken by each man to do various jobs is given in the table. All the jobs have to be completed and each person gets at least one job. Minimize the total time taken.

	J_1	J_2	J_3	J_4	J_5	J_6
M_1	10	9	7	6	8	5
M_2	7	4	8	6	5	9
M_3	3	6	9	8	4	7

   Reduce it to some known problem. (Justification required.) [4]

3. Solve using branch and bound method (only show the final picture). [8]

$$\begin{aligned} \min \quad & -2x - 3y \\ \text{s.t.} \quad & 2x + y \leq 150,\ x + 2y \leq 151,\ 4x + 3y \leq 152,\ x, y \in \mathbb{Z}_+. \end{aligned}$$