Indian Statistical Institute, Bangalore
MS (QMS) First Year
First Semester – Operations Research I

Final Exam — Date: April 17, 2021
Maximum marks: 50 — Duration: 2 hours

Answer as many questions as you can. The maximum you can score is 50

1. Mr. Sherin wants to invest Rs. 100,000 in SBI mutual funds. The fund manager has chosen six different bonds. The objective is to maximize the yield with limited risk. The details of the bonds chosen are given below.

Bond	Yield	Maturity Period in years	Rating
1	0.089	3	Very Good
2	0.092	5	Excellent
3	0.100	1	Fair
4	0.095	2	Fair
5	0.085	4	Excellent
6	0.090	5	Very Good

To meet the objective, the fund manager has decided the following:

   a. Don't invest more than 25% in one bond
   b. At least 50% of investment in long term bonds (maturity period more than 2 years)
   c. Restrict the investment in bonds with a rating less than very good not more than 35%

Formulate the problem as an optimization problem by clearly mentioning the decision variables, objective functions, constraints, etc.

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2. A manufacturing company makes two models A and B of a product. Each piece of Model A requires 9 labour hours for fabricating and 1 labour hour for finishing. Each piece of Model B requires 12 labour hours for fabricating and 3 labour hours for finishing. For fabricating and finishing, the maximum labour hours available are 180 and 30 respectively. The company makes a profit of Rs 8000 on each piece of model A and Rs 12000 on each piece of Model B.

   a. Formulate the problem as an optimization problem
   b. Provide optimum solution which would maximize profit?

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3. The cost of shipping from 3 plants to 4 warehouses of a cement manufacturing company is given below. The capacity of each plant as well as the demand at each warehouse is given below. Identify the optimum number of tons of cement to be transported from each plant to various warehouses so that the cost is minimum.

	Shipping cost to warehouses				
Plant	Ahmadabad	Udaipur	Bangalore	Mumbai	Capacity
Jafarabad	5	6	9	4	200
Chitragod	7	8	10	12	300
Gulbarga	5	11	6	8	400
Demand	200	175	275	250	

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4. A six-person team is entered in the World Greased-Pig Wrestling Championship. The following wrestler-task assignments, along with the average penalty points assessed in preliminary contests are given. Identify the optimal assignment which would minimize the penalty points for the entire team.

	Grabbing	Holding	Identifying	Jerking	Kicking	Loading
Arun	0	18	7	2	21	14
Basil	9	1	15	24	31	6
Carlos	19	28	10	20	34	12
Justin	4	16	16	3	13	32
Elson	17	23	8	26	15	29
Fedric	5	25	22	11	35	27

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