

SQC & OR Unit Indian Statistical Institute Bangalore
MS-QMS (Semester II) Operations Research - II
Mid-Term - 2022-23

Time: 2 Hours Date:

Answer all questions, you can score 30 marks. The value at the end of the question within the bracket represent the max marks.

Q1. There are n houses in a row numbered 1 through n . House i has $v_i, i = 1, 2, \dots, n$. A robber decides to rob k houses in such a way that no 2 adjacent houses are stolen. One of the stolen houses is the worst hit in the sense that v_i of that house is the maximum of v_j 's of the stolen houses. What is the minimum possible value of the worst-hit house? Formulate this problem as an integer linear programming problem [10].

Q2. Coal India Limited (CIL) is excavating at three sites and wishes to assign 5 additional trucks in such a way as to minimize its total costs. Each site can use 0 to 3 additional trucks; no site can use more than 3 trucks efficiently. The following site total costs are known in thousand of rupees ($\times 1000$).

No. of Trucks	Site 1	Site 2	Site 3
0	1000	1500	2000
1	1000	1400	1800
2	920	1325	1750
3	850	1275	1725

Use dynamic programming to find the assignment of the additional trucks that minimizes the total cost [10].

Q3. The 15 MS(QMS) students of ISI Bangalore need to present an oral seminar. They need to come to the professor's office. Assume there is a service rate of 10 (presentation) per hour and adequate time is available for all. The arrival rate for students is 5 per hour [10].

1. What is the probability that there is no one in the office when you come?
2. What is the average number of students in the office?
3. What is the expected time to start your presentation?
4. What is the expected time you need to spend in the office?
5. What is the probability that there is one student in the office?
6. What is the probability that a new arrival will have to wait?