Indian Statistical Institute Bangalore

Statistical Quality Control & Operation Research Unit MS (QMS) First Year [Batch 2024-2025] Second Semester – Operation Research-II

Exam: Midterm Maximum Marks: 30 Date: 20th February 2025 Duration: 2.5 hours

Figure in the right hand margin indicates full marks for the questions (Answer three full questions)

 a) An architect has been awarded a contract to prepare plans for an urban renewal project. 7 The job consists of the following activities and their estimated times.

Activity	Description	Immediate Predecessors	Time (Days)
А	Prepare preliminary sketches		2
В	Outline specifications		1
С	Prepare drawings	А	3
D	Write specifications	A, B	2
Е	Run off prints	C, D	1
F	Have specification	B, D	3
G	Assemble bid packages	E, F	1

i) Draw the network diagram of activities for the project.

- ii) Indicate the critical path, and calculate the total float and free float for each activity.
- b) Explain the term Activity Variance and Project Variance in the context of project 3 management.
- a) The ABC Electric Appliances Company produces two products: Refrigerators and ranges. 7 The production of these takes place in two separate departments. Refrigerators are produced in department I and ranges in department II. Both these are sold on a weekly basis. Due to the limited facilities in the departments the weekly production cannot exceed 25 refrigerators in department I and 35 ranges in department II. The company regularly employs a total of 50 workers in the departments. The production of one refrigerator requires two man-weeks of labour and of one range one man-week. A refrigerator contributes a profit of Rs 300 and a range of Rs 200. Formulate and solve this problem as an ILP problem to determine the units of refrigerators and ranges that the company should produce to realize the maximum profit using the Branch & Bound method.
 - b) Explain in brief how Gomory's cutting plane algorithm works.

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- a) An aircraft company uses rivets at a constant rate of 2,500 per year. Each unit costs Rs 30.
 5 The company personnel estimate that it costs Rs 130 to place an order, and that the carrying cost of inventory is 10 per cent per year. Determine the following
 - i) Economic order quantity for this inventory system.
 - ii) Optimal number of quantity to be placed in the given period.
 - iii) Optimal inventory cost.
 - b) A manufacturing company purchases 9,000 parts of a machine for its annual requirements, 5 ordering one month's requirement at a time. Each part costs Rs. 20. The ordering cost per order is Rs.15 and the carrying charges are 15 percent of the average inventory per year. You have been assigned to suggest a more economical purchasing policy for the company. What advice would you offer, and how much would it save the company per year.