

Registration No.:

--	--	--	--	--	--	--	--	--	--

Total Number of Pages: 02

Course: MBA/IMBA
Sub_Code: 18MBA403D/16IMN1001D4th/ 10th Semester Regular/Back Examination: 2025-26

SUBJECT: Operations Research Applications

BRANCH(S): BA, GM, MBA, IMBA

Time: 3 Hours

Max Marks: 100

Q.Code: V027

Answer Q1 (Part-I) which is compulsory, any eight from Part-II, and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 Answer the following questions:

(2 x 10)

- Define Operations Research.
- What is the difference between LPP and IPP?
- Explain Unbalanced TP briefly.
- Define flow shop scheduling and state its objective.
- How is travelling salesman problem different from Assignment problem?
- What is staff transfer problem?
- What is Reneging and Balking in queue theory?
- Differentiate between NLPP and LPP.
- What is the bin packing problem?
- Explain portfolio optimization briefly.

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)

(6 x 8)

- Explain different types of Operations Research models with examples.
- Describe the steps involved in Dynamic Programming problem approach.
- State the different steps involved in gomory's cutting plane method.
- Discuss six major areas of management where Operations Research techniques are applied with examples.
- Explain the concept of the Vehicle Routing Problem (VRP) and practical applications in logistics and distribution systems.
- Customers arrive at a service counter according to a Poisson process at an average rate of 6 customers per hour. The service time follows an exponential distribution with an average service rate of 8 customers per hour. Find
 - Average number of customers in the system,
 - Average waiting time in the queue,
 - Server busy and server idle.

- g) Explain the concept of Job Shop Scheduling. Discuss its objectives, assumptions, and importance in production and operations management.
- h) Explain Kendall's notation used in queuing theory. Discuss its components in detail and describe different types of queue disciplines with their significance in service systems.
- i) Find the IBFS of following TP using NWCR method.

Destinations	D1	D2	D3	Supply
Sources				
A	2	2	3	10
B	4	1	2	15
C	1	3	1	40
Demand	20	15	30	

- j) Explain the Kuhn–Tucker conditions in nonlinear programming. State the necessary conditions for optimality and discuss their significance in solving constrained optimization problems.
- k) Write short notes on Quadratic Programming and applications of NLPP.
- l) Discuss the staff transfer problem in operations research, explaining its formulation, and the optimization approach used to solve it.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Discuss the significance and scope of operations research in decision making with special reference to business administration. **(16)**

Q4 Use Branch and Bound method to solve the following LPP. **(16)**
 Max $Z = 4X + 3Y$
 Subject to Cons. $5X + 3Y \geq 30$, $X \leq 4$, $Y \leq 6$, $X, Y \geq 0$ and X, Y are integers.

Q5 A salesman plans to visit the cities Rourkela, Sonapur, Jajpur, and Berhampur, starting and ending at his home city Bhubaneswar. The inter-city distances (in km) are given in the table below: **(16)**

City	Bhubaneswar	Rourkela	Sonapur	Jajpur	Berhampur
Bhubaneswar	∞	103	188	136	38
Rourkela	103	∞	262	176	52
Sonapur	188	262	∞	85	275
Jajpur	136	176	85	∞	162
Berhampur	38	52	275	162	∞

- a) Determine the optimal route for the salesman such that he visits each city exactly once and returns to Bhubaneswar.
- b) Calculate the minimum total travelling distance.

Q6 Explain the concept and structure of a two-stage supply chain distribution problem, its objectives and key components. **(16)**