10th Semester Regular Examination: 2024-25
SUBJECT: Operations Research Applications
BRANCH(S): IMBA
Time: 3 Hours
Max Marks: 100
Q.Code: S037
Answer Question No.1 (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)

a)   Write any two limitations of the Operations Research approach.

b)   Give two key differences between Pure Integer Programming and Mixed Integer Programming?

c)   Give two real life applications of Travelling Salesman Problem?

d)   What do you mean by Transportation Problem?

e)   Define Balking and Reneging in a queuing system.

f)   Explain Degeneracy in Transportation Problems.

g)   What is meant by Vehicle Routing Optimization?

h)   Define Bin Packing System.

i)   Define Dynamic Programming and give one practical example.

j)   Write Mathematical Formulation of Transportation Problem.

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   (6 x 8)

a)   Explain job shop scheduling method with an example.

b)   What are the key challenges in solving real-world Transportation Problems?

c)   Solve the following transportation problem using the Northwest Corner Method:

Storehouse→ Company↓	A	B	C	D	Supply
P	4	6	8	5	150
Q	5	7	9	6	250
R	8	6	7	9	400
Demand	200	150	300	150	

d)   Explain the Wolfe's Method for solving Quadratic Programming Problems.

e)   Write a note on two stage Supply Chain Distribution Problems.

f)   What do you mean by Vehicle Routing Problems? Explain with an application.

g) A TV repairman has an average service rate of 5 repairs per hour, and arrivals follow a Poisson process at 3 per hour. Calculate Equipment Utilization and Average waiting time in the system.

h) Discuss few applications of Operation Research in Management

i) What are the major differences between IPP and LPP?

j) What do you mean by Bin Packing Problem, Illustrate it with an example.

k) Write a role of Computer in Operation Research.

l) Define and explain the key elements of a Queuing System with examples.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)   (16 x 2)

Q3   Explain in details various tools and techniques used in Operations Research with examples.   (16)

Q4   Solve the following Integer Programming Problem (IPP) using Branch and Bound Method: (16)

Maximize $z = 2x_1 + 3x_2$

Subject to:

$2x_1 + x_2 \leq 8$

$x_1 + 2x_2 \leq 8$

$x_1, \ x_2 \geq 0$ and integers.

Q5   Write notes on the following   (8 + 8)

a) Staff transfer problem

b) Portfolio optimization problem

Q6   a)   Test whether the function is convex, concave or neither   (8 + 8)

$$f(x) = x^4 + 6x^2 + 12x$$

b)   Explain the Kuhn-Tucker condition with applications