ASSIGNMENT

Course Code	**:**	**MMPO-001**
Course Title	**:**	**Operations Research**
Assignment Code	**:**	**MMPO-001/TMA/JULY/2026**
Coverage	**:**	**All Blocks**

Note: Attempt all the questions and submit this assignment to the Coordinator of your study centre. Last date of submission for July 2026 Semester is 31st October 2026 and for January 2027 Semester is 30th April 2027.

1. Define Operations Research. Explain its scope and discuss any three major limitations of Operations Research in managerial decision-making.
2. A retired person wants to invest up to an amount of Rs 30,000 in fixed income securities. His broker recommends investing in two bonds: Bond A yielding 7% and Bond B yielding 10%. After some consideration, he decides to invest at most Rs 12,000 in Bond B and at least Rs 6,000 in Bond A. He also wants the amount invested in Bond A to be at least equal to the amount invested in Bond B. What should the broker recommend if the investor wants to maximise his return on investment? Solve graphically.
3. Explain the importance of Integer Programming in business decisions. Give two real-life examples where Integer Programming is more appropriate than Linear Programming.
4. Discuss the situations where Monte Carlo Simulation is preferred over mathematical optimization techniques. Explain any two important steps in the Monte Carlo Simulation process.
5. Solve the following assignment problem to find the optimal solution using the Hungarian Assignment Method (HAM). Four workers are to be assigned to four different jobs (A, B, C, D) so as to minimize the aggregate time taken (in minutes). Based on previous experience, he has the information that the time taken by each worker for each job is given in the table below:

Time Taken (in minutes) by 4 Workers				
Worker	**Job**			
	Job A	Job B	Job C	Job D
1	45	40	51	67
2	57	42	63	55
3	49	52	48	64
4	41	45	60	55

1. Define Operations Research. Explain its scope and discuss any three major limitations of Operations Research in managerial decision-making.

Answer

Operations Research (OR) is a scientific and quantitative approach to decision-making. It uses mathematical models, data, logical analysis and suitable analytical techniques to help a manager choose the best possible course of action when resources are limited and several alternatives are available. The word 'best' may mean minimum cost, maximum profit, shortest time, highest output, least waiting, better service or some other clearly stated objective. OR does not replace the manager. It provides a structured basis for comparing alternatives so that managerial judgement can be used with better information.

Scope of Operations Research

The scope of OR is wide because most organizations face problems of scarce resources, competing activities and uncertain conditions. One major area is production and operations planning. OR can help decide what products should be produced, in what quantities and by which process. Linear programming is often used for product-mix decisions when labour, machine hours, raw material and capital are limited. Scheduling models can also be used to decide the sequence of jobs on machines, allocate workers to shifts and reduce idle time.

Inventory management is another important application. A business has to balance the cost of keeping stock against the risk and cost of running out of stock. OR models help determine order quantities, reorder levels, safety stock and review policies. When demand is uncertain, probability-based inventory models can be used. These decisions are especially useful in retailing, manufacturing, hospitals and spare-parts management where too much stock blocks capital but too little stock affects service.

Transportation and logistics decisions also come within OR. Transportation models help distribute goods from factories or warehouses to markets at minimum cost. Network models are useful for shortest-route, transshipment and distribution problems. Vehicle-routing ideas support delivery planning, while location models help in choosing warehouses, service centres or plants. In a supply chain, OR can therefore support decisions from sourcing and capacity planning to storage and final delivery.

OR is widely used in project planning and control. PERT and CPM help identify important activities, estimate completion time and focus managerial attention on the critical path. Resource-allocation models are useful when several projects compete for the same budget, people or equipment. Queuing models are used