Course Name:	Operations Analytics	Course Code	O-305
Roll No.		Marks	60
Total No. of Questions	6	Duration	3 Hours
Total No. of printed pages	04	Date	04-12-2024

Course Outcome Statements:
CO1. Relate the various approaches and methods implemented in large organizations for collection of operational data.
CO2. Classify the different models of Operation Analytics and their usages in businesses.
CO3. Apply Advanced Excel for decision making in appropriate model.
CO4. Examine problem of service analytics business focused problems using Excels Solver.
CO5. Interpret Operation Analytics Solutions on Transportation, Inventory decisions and Queuing model problems.
CO6. Create MIS and dashboards for data based decision making.

Instructions: -		Marks	BL	CO
Q. No 1 (All Questions are Compulsory)				

Q. No.		Questions			
Q. 1		Case/Case-let Study			

A manufacturing company produces a popular product that experiences monthly fluctuations in demand. These fluctuations are influenced by factors such as seasonal trends, market dynamics, and consumer behavior. For the company, accurate demand forecasting is not just important—it is critical for optimizing production planning, managing inventory levels, and minimizing operational costs. Overproduction leads to excess inventory and increased holding costs, while underproduction risks stock outs and customer dissatisfaction. To address these challenges, the company has implemented a **3-Year Moving Average** forecasting method. This simple yet effective approach leverages historical demand data to project future demand by averaging the most recent three months of actual demand. The method is particularly useful in identifying short-term trends while smoothing out random fluctuations in the data.

Month	Demand
1	280
2	288
3	266
4	295
5	302
6	310
7	303
8	328
9	309
10	315
11	320
12	332

	a.	**Analyze** the demand data for the first 12 months and explain how the 3-year moving average method can be used to forecast the demand for the 13th month. Calculate the forecasted demand for the 13th month using this method.	6	Level 4	CO4
	b.	**Determine** the accuracy of your forecasted demand for the 13th month using the 3-year moving average method. Calculate the Mean Absolute Deviation (MAD), Mean Squared Error (MSE), and Mean Absolute Percentage Error (MAPE) for the given data. What can you conclude about the effectiveness of the 3-year moving average method in this context?	6	Level 5	CO5
Q. 2		Answer **Any one** from the following.			
	a.	Consider a scenario involving a fast-food restaurant and its drive thru operation. The cars arrive at the restaurant at the rate of 40 cars per hour, and the average service rate of the drive-thru is 50 cars per hour. **Determine** the following to analyze the efficiency of the drive-thru system.: a) Probability that there are no cars in the drive-thru queue. b) The average number of cars in the drive-thru system. c) The average time a car spends in the drive-thru system. d) The average number of cars waiting in the queue. e) The average time a car spends waiting in the queue before getting service. f) The probability that the cashier at the service counter is busy when a car arrives at the drive-thru.	6	Level 5	CO5
	b.	**Compare** how descriptive analytics and predictive analytics can be applied in a retail business scenario to optimize inventory management for seasonal products. Discuss how each approach provides insights for decision-making and highlight their respective contributions to improving business outcomes.	6	Level 5	CO5
Q. 3		Answer **Any one** from the following.			
	a.	 The Distribution Unlimited Co. has two factories producing a product that needs to be shipped to two warehouses Factory 1 produces 80 units. Factory 2 produces 70 units. Warehouse 1 needs 60 units. Warehouse 2 needs 90 units. The number on top of each arrow shows the unit shipping cost along that shipping lane. There are rail links directly from Factory 1 to Warehouse 1 and Factory 2 to Warehouse 2. Independent	6	Level 4	CO4

		truckers are available to ship up to 50 units from each factory to the distribution center, and then 50 units from the distribution center to each warehouse. **Analyze** the given data and conclude how units (truckloads) should be shipped along each shipping lane?		
	b.	A retail company is evaluating its stocking policy for a new product. The company sells an average of 200 units per day, with a lead time of 5 days. The cost to place an order is $120, and the holding cost per unit per day is $0.50. The company wants to minimize its total inventory costs. **Analyze** the impact of stocking policies on the company's overall inventory costs.	6	Level 4 · CO4

Q. 4 — Answer **Any two** from the following.

a. A retail company is using regression analysis to forecast demand for a product. The historical demand data shows a seasonal pattern, with higher sales in the holiday months. **Apply** regression analysis to adjust for seasonality in the demand forecasting process. Explain the steps you would take to incorporate seasonal factors into the model, and how you would interpret the adjusted forecast to make inventory decisions.

(6 marks — Level 3 — CO3)

Month	Demand (units)
January	150
February	160
March	180
April	170
May	200
June	220
July	240
August	230
September	210
October	190
November	300
December	400

b. A software company is adopting the Balanced Scorecard framework to evaluate its performance in launching a new software product. **Make use of** the four perspectives of the Balanced Scorecard to assess how the company can align its product development strategy with its business objectives. For each perspective (Financial, Customer, Internal Processes, and Learning & Growth), propose relevant performance measures that can help track the success of the new product launch.

(6 marks — Level 3 — CO3)

c. **Construct** a comprehensive set of KPIs for an ecommerce platform to increasing conversion rates and customer engagement.

(6 marks — Level 3 — CO3)

Q. 5 — Answer **Any two** from the following.

	a.	**Explain** how service analytics can improve waiting line management and identify key metrics that are useful for assessing customer wait times.	6	Level 2	CO2
	b.	**Compare** and contrast the factors that influence customer service efficiency, and explain how they can be measured in a service-based industry.	6	Level 2	CO2
	c.	**Outline** the differences between a drill-down report and a summary report, and explain how a drill-down report can aid in decision-making.	6	Level 2	CO2
Q. 6		Answer **Any two** from the following.			
	a.	**Define** supply chain analytics and list its main components.	6	Level 1	CO1
	b.	**What** are performance metrics, and why are they important in business operations?	6	Level 1	CO1
	c.	**What** are the types of Operation Analytics and explain its application in E-commerce with example?	6	Level 1	CO1