PVP24

Code No: **24BA2O1A**

I MBA - II Semester – Regular / Supplementary Examinations
JULY 2026

BUSINESS ANALYTICS

Duration: 3 Hours Max. Marks: 70

Note: 1. This question paper contains two Parts: Part-A and Part-B.
2. Part-A contains 5 essay questions with an internal choice from each unit. Each Question carries 12 marks.
3. Part-B contains one Case Study for 10 Marks.
4. All parts of Question paper must be answered in one place

BL – Blooms Level CO – Course Outcome

PART - A

			BL	CO	Max. Marks
		UNIT – I			
1.	a)	Explain the concept of business analytics and discuss its significance in modern organizations.	L2	CO1	6 M
	b)	Provide examples of Business analytics to illustrate its practical applications.	L2	CO1	6 M
		OR			
2.	a)	Explain the key characteristics of three major types of analytics.	L2	CO1	6 M
	b)	Illustrate the techniques, and tools used in descriptive, predictive, and prescriptive analytics.	L2	CO1	6 M

UNIT – II					
3.	a)	Explain the concept of data warehousing.	L2	CO2	6 M
	b)	Discuss the advantages and challenges of implementing a data warehouse in a business environment.	L2	CO2	6 M
OR					
4.	a)	Identify the main challenges organizations face when implementing data mining techniques and Business Performance Management (BPM) systems.	L2	CO2	6 M
	b)	Discuss the role of data mining in marketing.	L2	CO2	6 M
UNIT-III					
5.	a)	Explain the concept of business analytics and its significance in modern organizations.	L2	CO3	6 M
	b)	Discuss the role of business analytics in driving organizational change.	L2	CO3	6 M
OR					
6.	a)	What is marketing analytics? Explain the role of marketing analytics in modern marketing strategies.	L2	CO3	6 M
	b)	Discuss the applications of marketing analytics in digital marketing.	L2	CO3	6 M
UNIT – IV					
7.	a)	Discuss the various predictive analytics tools and technologies used for data predictions.	L2	CO4	6 M

	b)	Discuss the applications of predictive analytics in different industries, such as healthcare, finance, and marketing.	L2	CO4	6 M
OR					
8.	a)	Explain how predictive analytics can be used to analyze customer behavior and improve marketing strategies.	L2	CO4	6 M
	b)	Discuss the common challenges faced by organizations when implementing predictive analytics models.	L2	CO4	6 M
UNIT – V					
9.	a)	Explain the concept of data interpretation and its significance in the process of data analysis.	L2	CO5	6 M
	b)	Discuss the concept of data visualization and its importance in making data more accessible and understandable.	L2	CO5	6 M
OR					
10.	a)	Discuss the features and capabilities of Tableau and Power BI as tools for descriptive analytics.	L2	CO5	6 M
	b)	Discuss the various applications of descriptive analytics in business operations.	L2	CO5	6 M

PART – B

11.	**CASE STUDY**	L3	CO2	10 M

A retail chain wants to predict monthly sales based on factors such as advertising spend, seasonal trends, and customer purchases data.

1. Which regression technique would be suitable for forecasting sales (linear regression, time series regression, or multiple regression?) Why?

2. How would you interpret the coefficients of the regression model to identify key sales drivers?

3. If your model shows multicollinearity issues, what steps would you take to address this problem?

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BUSINESS ANALYTICS

Duration: 3 Hours Max. Marks: 70

SCHEME OF VALUATION

PART - A

			BL	CO	Max. Marks
		UNIT - I			
1	a)	Explain the concept of business analytics and discuss its significance in modern organizations.	L3	CO1	6M
	b)	Provide examples of Business analytics to illustrate its practical applications.	L2	CO1	6M
		OR			
2	a)	Explain the key characteristics of three major types of analytics.	L2	CO1	6M
	b)	Illustrate the techniques, and tools used in descriptive, predictive, and prescriptive analytics.	L2	CO1	6M
		UNIT – II			
3	a)	Explain the concept of data warehousing.	L3	CO2	6M
	b)	Discuss the advantages and challenges of implementing a data warehouse in a business environment.	L2	CO2	6M
		OR			
4	a)	Identify the main challenges organizations face when implementing data mining techniques and Business Performance Management (BPM) systems.	L2	CO2	6M
	b)	Discuss the role of data mining in marketing	L4	CO2	6M
		UNIT – III			
5	a)	Explain the concept of business analytics and its significance in modern organizations.	L2	CO3	6M
	b)	Discuss the role of business analytics in driving organizational change.	L3	CO3	6M
		OR			

6	a)	What is marketing analytics? Explain the significance of marketing analytics in modern industry.	L3	CO3	6M
	b)	Discuss the applications of marketing analytics in digital marketing	L2	CO3	6M
		UNIT – IV			
7	a)	Discuss the various predictive analytics tools and technologies used for data predictions. *(L2, CO4, 6M)*	L4	CO4	6M
	b)	Discuss the applications of predictive analytics in different industries, such as healthcare, finance, and marketing.	L2	CO4	6M
		OR			
8	a)	Explain how predictive analytics can be used to analyze customer behavior and improve marketing strategies.	L3	CO4	6M
	b)	Discuss the common challenges faced by organizations when implementing predictive analytics models	L2	CO4	6M
		UNIT – V			
9	a)	Explain the concept of data interpretation and its significance in the process of data analysis.	L2	CO5	6M
	b)	Discuss the concept of data visualization and its importance in making data more accessible and understandable.	L4	CO5	6M
		OR			
10	a)	Discuss the features and capabilities of Business Intelligence (BI) as tools for organizations.	L3	CO5	6M
	b)	**b)** Discuss the various applications of Business Intelligence analytics in business.	L2	CO5	6M

PART – B

11.	**CASE STUDY**	**L3**	**CO3**	**10M**
	As a whole			

UNIT - I

1. a). Explain the concept of business analytics and discuss its significance in modern organizations.

Concept of Business Analytics

Business Analytics (BA) uses statistical tools and machine learning to turn raw data into actionable insights, helping organizations solve problems and drive growth.

Significance in Modern Organizations

BA is crucial for improving overall business performance. Key benefits include:

- Better Decisions: Moves companies from guessing to making evidence-based choices.
- Efficiency: Reduces costs and waste while improving productivity.
- Risk & Opportunity: Uncovers growth trends and assesses potential risks.
- Tracking: Uses Key Performance Indicators (KPIs) to measure success.
- Future Planning: Forecasts future demand and financial trends.
- Innovation: Inspires new products based on customer needs and market trends.

b). Provide examples of Business analytics to illustrate its practical applications.

Descriptive Analytics

Product Evaluation: A company reviews past customer satisfaction scores to understand the success of a recent product launch.

Predictive Analytics

Sales Forecasting: A retail company predicts its future sales by looking at past sales data and seasonal trends.

- **Customer Retention**: A telecom company predicts which customers are likely to cancel their service by analyzing their past usage patterns.
- **Risk Assessment:** A bank uses a customer's credit history to predict the likelihood of them defaulting on a loan.
- **Personalization:** An e-commerce site predicts which products a user will like based on their past purchases and browsing history.

Prescriptive Analytics

- Dynamic Pricing: A ride-sharing app determines the optimal price (surge pricing) and automatically matches drivers with passengers in real-time.

- **Route Optimization:** A logistics company calculates the most cost-effective delivery routes by balancing fuel costs, traffic, and delivery times.
- **Inventory Strategy**: A retailer uses data to find the best promotional strategy to boost sales without overstocking or understocking their shelves.

OR

2. a). Explain the key characteristics of three major types of analytics.

1. **Descriptive Analytics**
   - Purpose: Focuses on understanding what happened in the past.
   - Characteristics: It summarizes historical data and heavily relies on visual tools like charts and dashboards to make the data easy to read. It uses Key Performance Indicators (KPIs) to measure past performance and spot historical trends.
2. **Predictive Analytics**
   - Purpose: Focuses on forecasting what is likely to happen in the future.
   - Characteristics: It applies statistical techniques and machine learning algorithms to historical data to predict future trends. It helps businesses proactively assess risks, predict customer behavior, and prepare for different scenarios.
3. **Prescriptive Analytics**
   - Purpose: Focuses on actionable advice, suggesting exactly what actions a business should take.
   - Characteristics: It uses advanced mathematical models and simulations to optimize decision-making and find the best possible outcomes. It can evaluate multiple "what-if" scenarios and even automate real-time decisions.

b). Illustrate the techniques, and tools used in descriptive, predictive, and prescriptive analytics.

1. **Descriptive Analytics**

Techniques:

- Statistical Methods: Using calculations like mean, median, mode, variance, and standard deviation.
- Data Aggregation: Summing up or averaging data.

Tools:

- Data Visualization Tools: Power BI, Tableau, and Google Data Studio.

- Reporting: Reports and Dashboards to present data in an easily digestible format.

2. **Predictive Analytics**

Techniques:

- Statistical Models: Regression analysis and time series forecasting.
- Machine Learning: Algorithms such as decision trees, random forests, neural networks, and support vector machines.
- Data Mining: Discovering patterns and relationships within datasets.

Tools:

- Predictive Software: SAS, IBM SPSS, Python (using libraries like scikit-learn), and R.

3. **Prescriptive Analytics**

Techniques:

- Optimization Models: Linear programming, integer programming, and constraint-based modeling.
- Machine Learning & AI: Reinforcement learning and deep learning.
- Simulations: Monte Carlo simulations and scenario analysis.

Tools:

- Decision Support Tools: Prescriptive software such as IBM Decision Optimization, MATLAB, and specialized Python libraries (e.g., Pyomo, Gurobi)

UNIT – II

3.a).Explain the concept of data warehousing.

Concept of Data Warehousing

Data Warehousing is the process of collecting, storing, and managing massive amounts of structured data from various sources into one central location for analysis and reporting.

Here are the key points to understand about the concept:

- **What it is:** A Data Warehouse (DWH) is a specialized, centralized system designed specifically for querying, reporting, and making strategic decisions, rather than just processing daily transactions.
- **How it works:** Data is gathered from different operational systems, cleaned, and stored in a structured way. This consolidates the information so businesses can perform complex queries.

- **Main Goal:** The primary purpose is to help businesses analyze historical data, produce statistical results, and make informed decisions.
- **Efficiency:** It is built to ensure that data can be retrieved very quickly, even when dealing with vast datasets.

b). Discuss the advantages and challenges of implementing a data warehouse in a business environment.

Advantages of a Data Warehouse

- Data Consolidation: It brings together data from multiple different sources into a single, central repository, removing silos of information across departments.
- High Data Quality: Data is cleaned, transformed, and validated before it is stored, ensuring that it is highly accurate and consistent.
- Scalability: Data warehouses can easily handle and scale up resources to accommodate growing amounts of data as a business expands.
- Fast Query Performance: They are optimized for complex queries and reporting, ensuring fast data retrieval even when dealing with massive datasets.
- Strong Security: They include strict security features like user authentication, access control, and encryption to protect sensitive business information.

Challenges of a Data Warehouse

- High Costs: Setting up a data warehouse can be expensive due to the costs of software, storage, cloud services, and the specialized personnel needed to build it.
- Time-Consuming Implementation: Designing the architecture and building the ETL (Extract, Transform, Load) pipelines to move data from various sources takes a significant amount of time.
- Complexity: Managing and maintaining a data warehouse requires skilled IT professionals and data engineers to handle updates, backups, and system integrations.
- Data Integration Difficulties: It can be very difficult to combine data from older, incompatible systems into a single, unified format.

OR

4. a). Identify the main challenges organizations face when implementing data mining techniques and Business Performance Management (BPM) systems.

Challenges in Implementing Data Mining

- **Poor Data Quality**: If the raw data is incomplete, messy, or inaccurate, the mining algorithms will produce incorrect or misleading results (often called "garbage in, garbage out").
- **Privacy and Security:** Mining large datasets often involves handling sensitive customer information, which requires strict security measures and compliance with data privacy **laws.**
- **Need for Specialized Skills:** Data mining requires highly skilled professionals, like data scientists, who understand complex statistics and machine learning algorithms.
- **High Computing Costs:** Analyzing massive volumes of data requires powerful, expensive hardware and software systems.

b). Discuss the role of data mining in marketing

Role of Data Mining in Marketing

Data mining plays a vital role in marketing by helping businesses uncover hidden patterns in large datasets and predict future customer outcomes. Here are the simple, practical ways it is used based on your documents:

- **Customer Segmentation**: It uses techniques like clustering and classification to divide customers into groups based on similar purchasing behaviors or their overall value to the business (e.g., high-value vs. low-value customers). This helps marketers tailor their campaigns to specific audiences.
- **Market Basket Analysis:** By using association rule mining, businesses can identify which products are frequently bought together. This helps companies build cross-selling and upselling strategies.

UNIT – III

5. a).Explain the concept of business analytics and its significance in modern organizations.

Significance in Modern Organizations

Business analytics is highly significant because it leverages data to improve efficiency and overall business performance. Its key roles include:

- **Data-Driven Decision Making:** It shifts organizations from relying on intuition to making evidence-based choices.
- **Improving Operational Efficiency:** It optimizes business processes, which reduces costs and waste while boosting productivity.

- **Identifying Opportunities and Risks:** By analyzing customer behavior and market trends, companies can uncover new avenues for growth and mitigate potential risks.
- **Performance Monitoring:** It allows businesses to track Key Performance Indicators (KPIs) to measure success and pinpoint areas needing improvement.

b).Discuss the role of business analytics in driving organizational change.

- **Changing the Decision-Making Culture**: Analytics fundamentally changes an organization's mindset by shifting it from relying on intuition or "gut feelings" to making strictly evidence-based, data-driven decisions.

  Redesigning Processes: It drives operational change by identifying bottlenecks, inefficiencies, and waste, which leads to streamlined workflows and optimized operations.
- **Aligning Strategy**: When a company changes its strategic direction, Business Performance Management (BPM) tools use analytics to translate those new high-level goals into actionable targets for every department.
- **Fostering Innovation:** By analyzing customer needs and changing market trends, analytics pushes a company to evolve by inspiring new product development and process improvements.
- **Adapting to Market Shifts (Agility):** Predictive analytics and scenario planning allow organizations to model "what-if" situations, helping them quickly adapt, prepare contingency plans, and pivot during market changes.

OR

6 a). What is marketing analytics? Explain the significance of marketing analytics in modern industry.

What is Marketing Analytics?

Marketing analytics is the process of tracking and analyzing data generated by marketing efforts to achieve specific, measurable goals. The insights gained from this process help organizations improve customer experiences, boost the Return on Investment (ROI) of their marketing activities, and plan more effective future strategies.

Significance of Marketing Analytics in Modern Industry

Marketing analytics is highly significant in today's business landscape because it directly impacts a company's bottom line and customer relationships. Based on the documents provided, its key benefits include:

- **Better Decision-Making**: It provides concrete, data-driven insights, helping businesses make informed choices rather than relying on intuition or guesswork.
- **Improved Customer Understanding**: It analyzes customer behavior, preferences, and needs, which allows companies to create highly personalized and targeted marketing campaigns.

b). Discuss the applications of marketing analytics in digital marketing.

Applications of Marketing Analytics in Digital Marketing

Based on your provided documents, here are the simple and practical applications of marketing analytics specifically used in digital marketing:

- **Digital & Web Analytics**: It involves analyzing online user behavior by tracking website traffic metrics, such as user sessions, bounce rates, and the time visitors spend on a site.
- **Campaign Performance Analysis**: It evaluates the effectiveness of digital marketing efforts, such as email campaigns, social media posts, and online ads. This helps marketers understand what works best and optimize future digital campaigns for a better Return on Investment (ROI).
- **Customer Segmentation: It** divides online audiences into specific groups based on their demographics or behavior, allowing businesses to tailor their digital marketing messages and campaigns for better engagement.
- **Predictive Analytics:** It uses historical data to forecast future customer behavior, such as the likelihood of making an online purchase or churning (leaving). This enables proactive digital strategies like targeted upselling or sending retention offers.

UNIT – IV

7. a). Discuss the various predictive analytics tools and technologies used for data predictions.

Predictive Analytics Tools and Technologies

Based on the provided documents, predictive analytics relies on a combination of programming languages, libraries, and specialized software to process data and forecast future outcomes.

1. Predictive Software

These are specialized tools used for data mining, statistical analysis, and machine learning:

- SAS: A widely used software suite for advanced analytics and predictive modeling.

- **IBM SPSS: A comprehensive tool used for statistical analysis and predictive modeling.**

2. Python Tools & Technologies

Python is heavily used in predictive analytics due to its versatile, extensive libraries:

- Pandas: Used for data manipulation and cleaning, providing structures like DataFrames for efficient data handling.
- NumPy: Used for numerical computations, particularly when working with arrays and matrices.
- Scikit-learn: A comprehensive machine learning library containing various algorithms for regression, classification, clustering, and model evaluation.
- Matplotlib & Seaborn: Libraries used for data visualization to help understand patterns and communicate results.

b). Discuss the applications of predictive analytics in different industries, such as healthcare, finance, and marketing.

Applications of Predictive Analytics in Different Industries

Based on your provided documents, here are the simple applications of predictive analytics across the specific industries you mentioned:

1. **Marketing and Business**

- Customer Churn Prediction: Identifying which customers are likely to leave so the business can target them with specific retention strategies.
- Sales Forecasting: Estimating the future demand for products to better optimize staffing and inventory levels.
- Recommendation Systems: Suggesting products or services to customers based on their past browsing and purchasing behavior (like systems used by Amazon and Netflix).

2. **Finance**

- Credit Scoring: Evaluating the level of risk involved in lending money to specific individuals or businesses.
- Fraud Detection: Identifying unusual data patterns that suggest a fraudulent transaction is taking place.
- Algorithmic Trading: Making automated stock trades based on predicted market data trends

OR

8. a). Explain how predictive analytics can be used to analyze customer behavior and improve marketing strategies.

Analyzing Customer Behavior Using Predictive Analytics

Predictive analytics analyzes historical data and patterns to understand how customers act and what they might do next. Based on your documents, it helps in the following ways:

- Predicting Actions: It is used in Customer Relationship Management (CRM) to forecast specific behaviors, such as the likelihood of a customer making a purchase, engaging with a brand, or churning (leaving the company).
- Understanding Needs: By analyzing past interactions and buying patterns, businesses can anticipate what a customer will want or need in the future.

b). Discuss the common challenges faced by organizations when implementing predictive analytics models

Challenges in Implementing Predictive Analytics

Organizations face a few key challenges when implementing predictive analytics models:

- Data Quality: The accuracy of any prediction relies heavily on the quality of the data used. If the data is poor, incomplete, or inaccurate, it will directly lead to incorrect predictions.
- Complexity: Building accurate predictive models is a highly complex process. It requires specialized expertise in fields like data science and machine learning techniques.
- Interpretability: Some of the complex models used, such as neural networks, can be very difficult to understand or explain. This lack of interpretability can become a barrier for business leaders and decision-makers who need to rely on those insights to confidently make choices

UNIT – V

9. a). Explain the concept of data interpretation and its significance in the process of data analysis.

Concept of Data Interpretation

While data analysis involves finding patterns and "crunching the numbers," data interpretation is the process of making sense of those numbers. It involves reviewing the analyzed data and translating it into a meaningful story that can be understood in the context of the business. It is the critical step where professionals, like data scientists and business analysts, turn complex data results into clear, actionable insights.

Significance in the Data Analysis Process

Data interpretation is a vital part of the analytics process because raw data or complex models are not useful on their own. Its significance includes:

- Providing Context: It explains the "why" behind the numbers. As noted in your documents, simply crunching numbers has very limited value unless a person can interpret what that analysis actually means for the business and its competition.
- Driving Decision-Making: Interpretation bridges the gap between technical data models and business strategy, ensuring that leaders can use the findings to make informed decisions.

b). Discuss the concept of data visualization and its importance in making data more accessible and understandable.

Concept of Data Visualization

Data visualization is the process of presenting data and analytical findings through visual formats, such as charts, graphs, heatmaps, plots, and dashboards. It utilizes software tools like Tableau, Power BI, and Python libraries (such as Matplotlib and Seaborn) to turn raw numbers into visual representations.

Importance of Data Visualization

Visualizing data is crucial for making information accessible and easy to digest. Based on your documents, its importance includes:

- **Simplifying Complex Information:** It translates large, complicated volumes of data into visual formats that are much easier to understand at a glance.
- **Communicating with Non-Technical Audiences:** It bridges the gap between technical experts (like data scientists) and business leaders, allowing analysts to effectively communicate their findings to non-technical stakeholders.
- **Highlighting Trends and Patterns:** Visual tools like line charts, scatter plots, and bar graphs make it significantly easier to clearly spot historical trends, relationships, and hidden patterns within the data

OR

10. a). Discuss the features and capabilities of Business Intelligence (BI) as tools for organizations.

Features and Capabilities of Business Intelligence (BI) Tools

Based on your documents, Business Intelligence (BI) tools (such as Tableau, Power BI, and QlikView) are essential software used to manage and present data. Here are their simple features and capabilities:

Key Features

- Dashboards and Reports: They are used to build interactive dashboards and formatted reports that summarize large volumes of data into digestible formats.
- Data Visualization: They use visual elements like charts, graphs, and heatmaps to clearly present data and highlight trends.
- Real-Time Tracking: Many BI dashboards provide real-time visual insights, allowing businesses to monitor their operations at a glance as things happen.

b). Discuss the various applications of Business Intelligence analytics in business.

Applications of Business Intelligence and Analytics in Business

Based on your documents, Business Intelligence (BI) and analytics are applied across almost every area of a business to improve performance. Here are the simple, practical applications:

- Strategic Planning and Decision Making: BI tools translate high-level business strategies into actionable goals, helping leaders move away from guesswork and make evidence-based decisions.
- Performance Monitoring: Businesses use BI dashboards to track Key Performance Indicators (KPIs), which holds teams accountable and measures their success against company targets.
- Improving Operational Efficiency: Analytics helps identify bottlenecks, waste, and inefficiencies, allowing companies to streamline their workflows and better allocate their resources.
- Financial Management: BI applications are used to track cash flow, analyze the profitability of specific products or departments, and manage budgets to reduce unnecessary spending.

PART – B

CASE STUDY

AS A Whole

For presentation of the case 4 Marks

Analytical ability of the case by answering to the questions (Discretion of the examiner) 6 Marks