

BUSINESS ANALYTICS
(CBS3241)

Time Allotted : 2½ hrs

Full Marks : 60

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 4 (four) from Group B to E, taking one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve:

12 × 1 = 12

Choose the correct alternative for the following

- (i) Which of the following is a major advantage of spreadsheet technology in analytics?
 - (a) Unlimited storage capacity
 - (b) Easy data manipulation and visualization
 - (c) Advanced machine learning algorithms
 - (d) Automatic decision-making
- (ii) Statistical thinking in business decisions mainly emphasizes:
 - (a) Guess-based decision making
 - (b) Ignoring uncertainty
 - (c) Evidence-based analysis using data
 - (d) Eliminating statistical models
- (iii) Data visualization primarily helps managers to:
 - (a) Replace statistical analysis
 - (b) Understand patterns and trends easily
 - (c) Increase database storage
 - (d) Eliminate decision uncertainty
- (iv) Continuous random variables can take:
 - (a) Only integer values
 - (b) Only negative values
 - (c) Any value within a range
 - (d) Only whole numbers
- (v) Chi-square test for independence is used to:
 - (a) Compare means
 - (b) Test relationships between categorical variables
 - (c) Predict continuous outcomes
 - (d) Predict continuous outcomes
- (vi) Which forecasting model is specifically designed to handle data with both a trend and seasonality?
 - (a) Simple Moving Average
 - (b) Simple Exponential Smoothing
 - (c) Holt-Winters
 - (d) Naive Forecast

- (vii) A 'Data Table' in Excel is primarily used for which modelling task?
 - (a) Performing Sensitivity Analysis (What-If Analysis)
 - (b) Sorting data alphabetically
 - (c) Generating random numbers for simulation
 - (d) Creating 3D charts
- (viii) Which algorithm is most commonly used to solve linear optimization models?
 - (a) Decision Tree induction
 - (b) Gradient Descent
 - (c) The Simplex Method
 - (d) K-Means Clustering
- (ix) Why is sensitivity analysis more difficult for Integer Optimization than for Linear Optimization?
 - (a) Integer models are always non-linear
 - (b) Small changes in inputs can lead to large, discrete jumps in the solution
 - (c) Integer models do not have objective functions
 - (d) Shadow prices are always infinite in integer models
- (x) The Expected Value of Perfect Information (EVPI) is calculated as:
 - (a) EMV with perfect info minus EMV under uncertainty
 - (b) The highest payoff plus the lowest payoff
 - (c) The shadow price times the probability
 - (d) The cost of hiring a consultant

Fill in the blanks with the correct word

- (xi) The development of Business Analytics has evolved from simple reporting to _____ analytics that predicts future outcomes.
- (xii) The process of selecting a subset of individuals from a population is called _____.
- (xiii) The statistical test used to determine whether two categorical variables are independent is called the _____ test.
- (xiv) _____ simulation is a technique that uses repeated random sampling to analyse uncertainty.
- (xv) A _____ is a line that best represents the general direction of data points in a dataset.

Group - B

2. (a) *"A debt collection agency wants to use its resources, mainly calls to debtors, in a better way. It collects data on payments which is enriched by external data on household composition and neighbourhood characteristics."* Consider the Test Case and discuss the role of Prescriptive Analytics to predict, given the characteristics of the debt and the actions taken by the agency, the probability that the debtor will pay off their debt? [[C01](C02)(Analyse/IOCQ)]
- (b) Differentiate between Business Analysis and Business Analytics. [[C01](Understand/LOCQ)]
- (c) The probability that a contractor will get a plumbing contract is $\frac{2}{3}$ and the probability that he will not get an electrical contract is $\frac{5}{9}$. If the probability of

getting at least one contract is 4/5, what is the probability that he will get both contracts?

[[CO4](Apply/IOCQ)]

5 + 2 + 5 = 12

3. (a) Evaluate the role of software support and spreadsheet technology in Business Analytics with suitable examples. [[CO2](CO3)(Remember/LOCQ)]
- (b) Analyse the use of Business Analytics in the home lending and mortgage industry, focusing on risk assessment and customer profiling. [[CO2](CO6)(Understand/LOCQ)]
- (c) Explain the different sources of Internal Data and External Data for business enterprises. [[CO1](Understand/LOCQ)]

3 + 4 + 5 = 12

Group - C

4. (a) Three salesmen A, B, and C have been given a target of selling 10,000 units of a particular product. The probabilities of their success are 0.55, 0.70, and 0.85 respectively. If all three salesmen try to sell the product, find the probability that only one salesman succeeds and the other two fail. [[CO4](Apply/IOCQ)]
- (b) Why are discrete probability distributions important in business analytics? [[CO5](Remember/LOCQ)]
- (c) What are Type I and Type II errors, and why are they important to managers? [[CO5](Understand/LOCQ)]

5 + 3 + 4 = 12

5. (a) Compare and contrast the binomial and Poisson distributions in practical business contexts. [[CO4](CO5)(Understand/LOCQ)]
- (b) Explain how probability theory supports managerial decision-making under uncertainty? [[CO4](CO5)(Understand/LOCQ)]
- (c) Discuss the characteristics of modern Business Analytics and explain how big data and AI have influenced it. [[CO1](CO2)(Remember/LOCQ)]

4 + 5 + 3 = 12

Group - D

6. (a) Explain TREND and CYCLE in the light of timeseries analysis in business? [[CO3](Remember/LOCQ)]
- (b) The sales of a company (in million dollars) for each year are shown in the table below. Find the least square regression line $y = a x + b$.

x (year)	2020	2021	2022	2023	2024
y (sales)	12	19	29	37	45

[[CO4](Apply/LOCQ)]

- (c) Explain Autocorrelation in time series analysis. [[CO4](Remember /LOCQ)]

4 + 6 + 2 = 12

7. (a) Explain with example the application of multiple linear regression in business decision making.

- How probability theory supports managerial decision-making under uncertainty? [[C04](Analyse/IOCQ)]
- (b) How are random variates generated using Excel functions? [[C04](Remember/LOCQ)]
- (c) Explain ARMA model in time series analysis. [[C04](Remember/LOCQ)]
- 4 + 4 + 4 = 12**

Group - E

8. (a) What are the essential components of a Linear Optimization model? [[C05](Remember/LOCQ)]
- (b) How is Linear Optimization used in Supply Chain and Logistics? [[C05](Understand/LOCQ)]
- (c) Discuss the concept of Risk Profiles in Decision Analysis. [[C05](Understand/LOCQ)]
- 4 + 4 + 4 = 12**
9. (a) What are Capital Budgeting models in the context of Binary Optimization? [[C05](Understand/LOCQ)]
- (b) Discuss the application of Tornado Charts for sensitivity analysis. [[C05](Remember/LOCQ)]
- (c) Explain the Roll-Back technique for analyzing Decision Trees. [[C05](Remember/LOCQ)]
- 3 + 5 + 4 = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	80.21	19.79	0