Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination Dec 2024

RA3EL38 Industrial Data Analysis & Decision Making

Programme: B.Tech. Branch/Specialisation: RA

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

			Marks	BL	PO	CO	PSO
Q.1	i.	Data analysis is a process of- (a) Inspecting data (b) Cleaning data (c) Transforming data (d) All of these	**1**	1	1	1	1
	ii.	Which of the following is not a major data analysis approaches? (a) Data mining (b) Predictive intelligence (c) Business intelligence (d) Text analytics	**1**	1	1	1	1
	iii.	How many main statistical methodologies are used in data analysis? (a) 2 (b) 3 (c) 4 (d) 5	**1**	1	2	1	1
	iv.	Data Analytics uses _____ to get insights from data. (a) Statistical figures (b) Numerical aspects (c) Statistical methods (d) None of these	**1**	1	2	1	1
	v.	A graph that uses vertical bars to represent data is called- (a) Bar graph (b) Line graph (c) Scatter graph (d) None of these	**1**	1	3	1	1
	vi.	A type of graph representing data in a circular form, with each slice of the circle representing a fraction or proportionate part of the whole- (a) Pie chart (b) Bar chart (c) Histogram (d) Pictogram	**1**	1	3	1	1

P.T.O.

vii.	The process of collecting and evaluating information or data from multiple sources to find answers to research problems- (a) Data integration (b) Data collection (c) Data preparation (d) Data transformation	**1**	1	4	1	1			
viii.	A systematic procedure that helps decision makers deal with conflicting evaluations- (a) MODM (b) MCDM (c) DSS (d) ISM	**1**	1	4	1	1			
ix.	The primary purpose of Monte Carlo Simulation is- (a) To predict exact outcomes (b) To model the impact of risk and uncertainty (c) To create financial statements (d) To analyze historical data	**1**	1	5	1	1			
x.	A statement made about a population for testing purpose is called- (a) Statistic (b) Hypothesis (c) Level of significance (d) Test-Statistic	**1**	1	5	1	1			
Q.2 i.	Explain the applications of statistics.	**2**	2	1	1	1			
ii.	What are the limitations of statistics?	**3**	2	1	1	1			
iii.	Explain objectives and scope of business analytics.	**5**	2	1	1	1			
OR iv.	Explain the nature and characteristics of statistics.	**5**	2	1	1	1			
Q.3 i.	Explain various data types with examples.	**3**	2	2	1,12	1,2			
ii.	Explain different data collection methods.	**7**	2	2	1,12	1,2			
OR iii.	Describe the concept of transactional data collection and its importance in business analytics.	**7**	2	2	1,12	1,2			

Q.4 i.	How data is represented using histogram?	**3**	2			1,2			
ii.	Explain the application of measures of central tendency and dispersion for business decision making.	**7**	2			1,2			
OR iii.	Calculate standard deviation from the following data-	**7**	2			1,2			

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of Students	10	18	27	32	24	09

Q.5 i.	Discuss how linear regression analysis method helps in decision-making and forecasting.	**4**	3	4	1,2, 12	1,2			
ii.	Describe the fundamental concepts of correlation analysis and its importance in understanding the relationships between variables.	**6**	3	4	1,2, 12	1,2			
OR iii.	The mean outer diameter of a bearing of 25 randomly selected units is observed to 10.6 cm with standard deviation of 1.15cm. Is it significantly different from mean of 11 cm?	**6**	3	4	1,2, 12	1,2			
Q.6	Attempt any two:								
i.	Discuss the key principles of multi-objective decision making. Illustrate how these principles can be applied in a practical context.	**5**	2	5	1,12	1			
ii.	Explain the core concepts of decision models and their importance in decision-making processes.	**5**	2	5	1,12	1			
iii.	Explain the Monte Carlo simulation technique and its role in decision-making processes.	**5**	2	5	1,12	1			

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Marking Scheme
RA3EL38 Industrial Data Analysis & Decision Making

			Marks
Q.1	i.	Data analysis is a process of- (d) All of these	**1**
	ii.	Which of the following is not a major data analysis approaches? (b) Predictive intelligence	**1**
	iii.	How many main statistical methodologies are used in data analysis? (a) 2 (b) 3 (c) 4	**1**
	iv.	Data Analytics uses _____ to get insights from data. (c) Statistical methods	**1**
	v.	A graph that uses vertical bars to represent data is called- (a) Bar graph	**1**
	vi.	A type of graph representing data in a circular form, with each slice of the circle representing a fraction or proportionate part of the whole- (a) Pie chart	**1**
	vii.	The process of collecting and evaluating information or data from multiple sources to find answers to research problems- (b) Data collection	**1**
	viii.	A systematic procedure that helps decision makers deal with conflicting evaluations- (b) MCDM	**1**
	ix.	The primary purpose of Monte Carlo Simulation is- (b) To model the impact of risk and uncertainty	**1**
	x.	A statement made about a population for testing purpose is called- (b) Hypothesis	**1**

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ANSWER KEY

Q.1 MCQ

QUES.	ANS	QUES.	ANS
i	d	vi	a
ii	b	vii	b
iii	a / b / c	viii	b
iv	c	ix	b
v	a	x	b

(iii) Descriptive, Interential, predictive, Prescriptive.
② ③ ④

(viii) b (MCDM)

Q 2 (i) 2 marks
(a) Business & economics
(b) Healthcare & medicine
(c) Govt. & public policy
(d) Manf. & Engg.
(e) education
(f) sports (g) environment science (h) Tech. & data science
(i) Phychology & Behavior science

Q 2 (ii) 3 marks
(a) Data quality & Accuracy (b) Misinterpretation of results
(c) Assumption (d) complexity & expertise (e) subjectivity in decision
(f) Limitation in predictive power (g) Ethical concern

Q 2 (iii) 5 marks
objective: (a) improved decision making (b) operation efficiency (c) Strategic planning
(d) customer insight (e) Risk mgmt (f) Performance monitoring

Scope: (a) Descriptive analytics (b) Predictive Analytics
(c) Prescriptive analytics (d) Diagnostic Analytics

Application: (a) marketing (b) Finance (c) operations (d) Human Resources (e) Healthcare (f) Retail

Q 2 (iv) 5 marks
Nature: (a) Science & Art (b) Quantitative
(c) Aggregative (d) Partial application (e) Interdisciplinary.

Charateristics: (a) collection of data (b) classification & organization (c) Numerical representation.
(d) Estimation & prediction. (e) Variation & uncertainity
(f) Interpretation

Q 3 (i) 5 marks
Types of data
- quantitative — discrete / continous
- qualitative — Nominal / ordinal
- Binary
- Time series
- cross-sectional
- Structured / Unstructured

Q 3 (ii) 7 marks
Diff. data collection method

(a) primary
- surveys / questionnires
- Interviews
- observations
- Expesiments
- focus group
- Field study

secondary
- published sources
- online Database
- company Records
- Historical Records
- media & web content
- M/c learning

P.T.O.

4 marks

Q 3 (iii) Transactional data is the detailed time-specific information recorded during a business activity, such as a purchase, payment, or shipment.

Key characteristics — Event based, detailed, structured

Important in Business Analysis :

(a) customer insights (b) Performance monitoring (c) forecasting (d) Fraud detection (e) Enhanced experience (f) Strategic decision

Challenges: - (a) managing large data volume
(b) Integrating data from multiple systems
(c) Real-time processing needs
(d) Ensuring data privacy & regulatory compliance.

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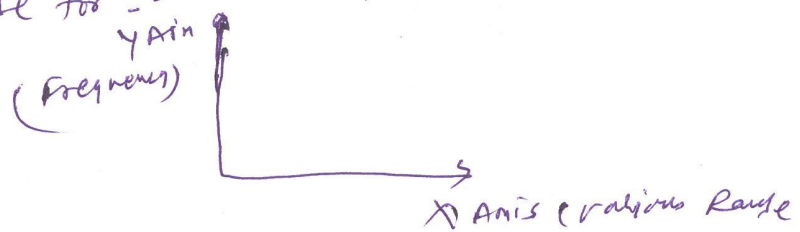
3 marks

Q 4 (i) How data is represent using histogram?

Histogram :- representation of data that shows the frequency distribution of a data set.

use for :- Shape, Spread, & Pattern



4 marks

Q 4 (ii) (a) Application in business — (central tendency)
(a) orgnise the data
(b) count frequencies
(c) plot the graph
- setting price
- Sales & marketing strategies
- Budget allocation
- Performance evaluation

(b) (measure of dispersion) App. in business —
- Risk assessment
- Quality control
- Customer segment
- Inventory mgmt
- Market Analysis

Q 4 (iii)

4 marks

marks Range	mid (xi)	freq (fi)	(fi)(xi)	$f_i \cdot x_i^2$
0-10	$\frac{0+10}{2}=5$	10	10.5=50	$(10)\cdot(5)^2 = 250$
10-20	$\frac{10+20}{2}=15$	18	270	$18 \cdot 15^2 = 4050$
20-30	25	27	675	$27 \cdot 25^2 = 16875$
30-40	35	32	1120	$32 \cdot 35^2 = 39200$
40-50	45	24	1080	$24 \cdot 45^2 = 48600$
50-60	55	9	495	$9 \cdot 55^2 = 27225$
Total		120	3690	136200

$$\text{Mean}(\bar{x}) = \frac{\sum f_i \cdot x_i}{\sum f_i} = \frac{3690}{120} = 30.75$$

$$\text{Variance}(\sigma^2) = \frac{\sum f_i \cdot x_i^2}{\sum f_i} - \left(\frac{\sum f_i x_i}{\sum f_i}\right)^2 = \frac{136200}{120} - \left(\frac{3690}{120}\right)^2$$

$$\sigma^2 = 1135 - (30.75)^2$$

$$\sigma^2 = 189.4375$$

$$\text{Std. deviation } \sigma = \sqrt{189.4375} \simeq 13.76$$

= * =

6 marks

Q 5 (ii) sample mean ($\bar{x}$) = 10.6 cm, hypothesis mean (μ) = 11 cm — one sample t-test

Sample size (n) = 25, σ = 1.15 cm

$$t = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = -1.739$$

Dof (df) = $n-1 = 24$

t-value (critical) = ± 2.064

$|-1.739| = 1.739$

Rule: If $|t| > t_{critical}$ reject H_0
If $|t| \le t_{critical}$, fail to reject H_0

& $t_{critical} = 2.064$

i.e. $|t| < t_{critical}$

Fail to reject H_0