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1612E1548

Candidate's Seat No:____

IMSc CS Sem.-7 Examination
Full Stack Web Development
December-2025

Time : 2.30 Hours] [Max.Marks : 70

Instructions:

- **Write both Sections in the separate answer book.**
- **Both Sections have equal weightage.**
- **Draw Diagrams wherever necessary.**
- **Make Assumptions wherever necessary.**

SECTION – I (35 Marks)

Q.1 Attempt ANY THREE of the following:

(5 × 3 = 15 Marks)

a) Explain asynchronous programming in JavaScript using Promises with an example.
b) What is DOM? Explain the DOM tree structure with a diagram and an example.
c) Explain features of Node.js that support high-performance, event-driven applications.
d) What are Union and Intersection types in TypeScript? Provide examples.
e) What are React Hooks? Explain useState and useEffect with examples.

Q.2 Attempt ANY SEVEN of the following:

(7 × 2 = 14 Marks)

a) What is JSON?
b) List any two features of Node.js.
c) What is callback hell?
d) Define a component in React.
e) Write two npm commands.
f) What is CORS?
g) Define a tuple with an example in TypeScript.
h) What is conditional rendering in React?
i) What is the use of the fs module in Node.js?

Q.3 Attempt ANY SIX of the following:

(6 × 1 = 6 Marks)

a) Expand JSX.
b) Symbol used for optional properties in TypeScript.
c) State the full form of API.
d) Mention any one primitive type of JavaScript.
e) Name the module used for encryption in Node.js.
f) Define props.
g) Which hook is used for managing side-effects?
h) Which file stores application metadata in Node.js?

SECTION – II (35 Marks)

Q.1 — Multiple Choice Questions

(1 × 10 = 10 Marks)

1. React applications are primarily built using:
   a) TSX/JSX b) HTML c) CSS d) SQL

2. HTTP method used to partially update a resource:
   a) GET b) POST c) PATCH d) OPTIONS

3. Which TypeScript type represents values that never occur?
   a) never b) any c) unknown d) void

4. Node.js uses _____ engine.
   a) V8 b) Rhino c) Chakra d) Nashorn

5. In Express.js, routes are defined using:
   a) app.route() b) app.use() c) app.get() d) app.db()

6. JSON keys must be written in:
   a) lowercase only b) uppercase only c) string format d) numeric format

7. The hook used to manage side effects:
   a) useState b) useEffect c) useId d) useRef

8. In TypeScript, optional properties are marked using:
   a) & b) : c) ? d) #

9. To install Express locally:
   a) node install express
   b) npm install express
   c) install express
   d) express install

10. Which module handles file operations in Node.js?
    a) os b) fs c) url d) crypto

Q.2 Attempt ANY THREE of the following:

(5 × 3 = 15 Marks)

a) Write a Node.js program using the fs module to write data to a file and then read it.
b) Create a React functional component using TypeScript to display a student's name and age using props.
c) Write Express.js API routes for GET all products and POST new product (dummy data allowed).
d) Explain protected and nested routing in React Router with examples.
e) Match the following (1 × 5 = 5 Marks)

Column A	Column B
1. crypto module	a. Routing in React
2. useState	b. Create server
3. http module	c. Memoized callback function
4. Router	d. Manage component state
5. useCallback	e. Encryption & hashing

Q.3 Attempt ANY FIVE of the following:

(2 × 5 = 10 Marks)

a) What is the Event Loop?
b) Define Axios and its purpose.
c) What is the role of a constructor in JavaScript?
d) Define tuple type in TypeScript.
e) What is conditional rendering in React?
f) Explain the zlib module usage in brief.
g) What is the difference: var vs let vs const?

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Candidate's Seat No:____

MSc CS Sem.-7 Examination

Data Analytics

December-2025

Time : 2.30 Hours] [Max.Marks : 70

Instructions:

- **Write both the Sections in the separate answer book.**
- **Both Sections having equal weightage.**
- **Draw Diagrams wherever necessary.**
- **Make Assumptions wherever necessary.**

SECTION – I

Q-1 Consider the following data: [10]

27	25	20	15	30	34	28	25

(a) Compute the mean and mode.

(b) Compute the 20^{th} and 65^{th} percentile.

(c) Compute five number Summary.

(d) Draw Box plot. Do the data contain any outliers?

(e) Compute the lower and upper limits.

Q-2 Answer the following. **(Any Four)** [20]

(a) Write a code of plotting Ogive using matplotlib.

(b) What is data preprocessing? Explain its importance and the steps involved in it.

(c) Calculate the sample covariance and correlation of the following data,

X	4	6	11	3	16
y	50	50	40	60	30

(d) Explain the concept of z-scores. How are they calculated, and how do they help in identifying outliers and understanding relative location?

(e) Data indicating the preferred shows for a sample of 40 viewers follow.

DH	CSI	Trace	DH	CSI	CSI	L&O	DH
L&O	DH	L&O	CSI	DH	L&O	Trace	DH
CSI	DH	DH	Trace	DH	Trace	CSI	CSI
Trace	Trace	DH	L&O	CSI	L&O	CSI	Trace
DH	CSI	CSI	DH	Trace	L&O	L&O	L&O

(a) Are these data categorical or quantitative?

(b) Provide frequency and percent frequency distributions.

(c) Construct a bar chart and a pie chart.

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Q-3 Answer the following. [5]

(a) Some hotels ask their guests to rate the hotel's services as excellent, very good, good, and poor. This is an example of the

a. Ordinal b. Ratio

c. Nominal d. Interval

(b) In a cumulative relative frequency distribution, the last class will have a cumulative relative frequency equal to_____.

(c) The measure of location which is the most likely to be influenced by extreme values in the data set is the

a. Range b. Median

c. Mode d. Mean

(d) Define: Robust Scaler

(e) Define: Cross- Sectional Data

SECTION – II

Q-4 The following data are the monthly salaries y and the grade point averages x for students who obtained a bachelor's degree in business administration with a major in information systems. The estimated regression equation is $\hat{y} = 1790.5 + 581.1\,x$ [10]

GPA	Monthly Salary
2.6	3300
3.4	3600
3.6	4000
3.2	3500
3.5	3900
2.9	3600

(a) Develop a scatter diagram for these data and What does the scatter diagram indicate about the relationship between the two variables?

(b) Compute SSE, SST, and SSR.

(c) Compute the coefficient of determination r^2. Comment on the goodness of fit.

(d) Compute the sample correlation coefficient.

(e) Does the t *test* indicate a significant relationship between grade point average and monthly salary? What is your conclusion? Use $\alpha = 0.05$.

Q-5 Answer the following. (Any Four) [20]

(a) The average stock price for companies making up the S&P 500 is $30, and standard deviation is $8.20. Assume the stock prices are normally distributed. ($P(z \leq 1.22) = .8888$, $P(z \leq -1.22) = .1112$, $P(z > 1.87) = 0.9693$)

(a) What is the probability a company will have a stock price of at least $40?

(b) What is the probability a company will have a stock price no higher than $20?

(c) How high does a stock price have to be to put a company in the top 10%?

(b) A consulting firm submitted a bid for a large research project. The firm's management initially felt they had a 50–50 chance of getting the project. However, the agency to which the bid was submitted subsequently requested additional information on the bid. Past experience indicates that for 75% of the successful bids and 40% of the unsuccessful bids the agency requested additional information.

(a) What is the prior probability of the bid being successful (that is, prior to the request for additional information)?

(b) What is the conditional probability of a request for additional information given that the bid will ultimately be successful?

(c) Compute the posterior probability that the bid will be successful given a request for additional information.

(c) Consider the time series data for 7 consecutive months follow.

24	13	20	12	19	23	15

(a) Construct a time series plot. What type of pattern exists in the data?

(b) Develop three-month averages for this time series.

(c) What is the moving average forecast for the next month?

(d) Use a smoothing constant of $\alpha = 0.4$ to compute the exponential smoothing forecasts.

(d) Explain the difference between one-tailed and two-tailed tests with diagrams.

(e) Define random variable and distinguish between discrete and continuous types.

Q-6 **Answer the following.** [5]

(a) Define: Type – II Error

(b) Write down the PMF of Hypergeometric Distribution.

(c) When dealing with the number of occurrences of an event over a specified interval of time or space, the appropriate probability distribution is a

a. Binomial Distribution b. Poisson Distribution

c. Normal Distribution d. Hypergeometric Distribution

(d) If A and B are independent events with $P(A) = 0.65$ and $P(A \cap B) = 0.26$, then, $P(B) =$ _____.

(e) Define: Seasonal Pattern