Name:

Enrolment No:

UPES

End Semester Examination, December 2024

Course: Statistical Modelling and Simulation **Semester: I**

Program: M.Tech (Health Safety and Environment) **Time: 03 hrs**

Course Code: HSFS7029 **Max. Marks: 100**

Instructions:

a) Read all the questions carefully
b) There are no options or choices and all the questions are compulsory
c) Calculators can be used for arithmetic's only
d) Perform the rough work besides the answers for more clarity and preciseness.
e) While solving problems adopt a stepwise approach and label/highlight the step numbers involved and the result.

SECTION A (5Q x 4M = 20 Marks)

S. No.	Statement (s) of the question (s)	Marks	CO
Q1	Explain Sheppard's corrections and its Use.	4	CO1
Q2	Explain Null and Alternate Hypothesis with an Example.	4	CO1
Q3	Differentiate between Correlation and Regression.	4	CO2
Q4	Define Conditional Probability. Explain with an example.	4	CO2
Q5	Define Homoscedasticity. Explain with an example.	4	CO2

SECTION B (4Q x 10M = 40 Marks)

Q6 — UPES recently conducted Urja (Sports Festival). Five times trials have been conducted and the number of students selected for the games in four different sports events (Cricket, Football, Badminton and Volleyball) have been recorded and is provided in the table below.

Trails	Cricket	Football	Badminton	Volleyball
1	8	12	18	13
2	10	11	12	9
3	12	9	16	12
4	8	14	6	16
5	7	4	8	15

Marks: 10 CO: CO4

<table>
<tr><td></td><td>With the help of One-way ANOVA determine whether there is significant difference between the samples. Provide F statistics and p value (absolute or range). Kindly refer the ANOVA table provided.</td><td></td><td></td></tr>
<tr><td>Q7</td><td>The weather forecast predicts that there is a 70% chance of rain and 80% of rainy days are predicted accurately, but it predicts rain on 20% of non-rainy days. Determine the probability of rain given a forecast of rain.</td><td>10</td><td>CO3</td></tr>
<tr><td>Q8</td><td>The Exam score for a class of 13 students is provided below
[54, 66, 71, 23, 45, 72, 89, 93, 19, 57, 88, 81, 77, 33].
Calculate the Skewness and Kurtosis for the data set and represent them as a diagram. Explain the results.</td><td>10</td><td>CO3</td></tr>
<tr><td>Q9</td><td>The chlorides content (ppm) of several lakes in lower reaches of Himalayas were collected along with the total dissolved solids (TDS). This is provided in the Table below. Compute the Regression for the same. Highlight the slope and y intercept in the Regression equation.

<table><tr><th>Chlorides (ppm)</th><th>TDS (ppm)</th></tr><tr><td>185</td><td>1770</td></tr><tr><td>277</td><td>1872</td></tr><tr><td>488</td><td>3583</td></tr><tr><td>319</td><td>3127</td></tr><tr><td>209</td><td>1263</td></tr><tr><td>166</td><td>1421</td></tr><tr><td>487</td><td>3624</td></tr><tr><td>402</td><td>2777</td></tr><tr><td>672</td><td>5128</td></tr><tr><td>199</td><td>1071</td></tr></table></td><td>10</td><td>CO3</td></tr>
<tr><td colspan="4">SECTION C (2Q x 20M = 40 Marks)</td></tr>
<tr><td>Q10</td><td>Explain Index numbers? Mention the various types. Enumerate and describe the weighted and unweighted methods for construction of Index numbers? Explain with examples. Explain the following Index numbers with their formula and a suitable example: a) Laspeyres Index b) Paasche Index c) Edgeworth-Marshall Index d) Fisher’s Index</td><td>20</td><td>CO3</td></tr>
<tr><td>Q11</td><td>For three consecutive years, the performance rating of three MNC’s i.e. Royal Dutch Shell, BP and Chevron on a score of 15 (4-5 times in the year) has been provided below.
<table><tr><th>Years</th><th>Royal Dutch Shell</th><th>BP</th><th>Chevron</th></tr><tr><td>1</td><td>10,8,7,9,6</td><td>7,4,3,2</td><td>11,9,10,9,11</td></tr><tr><td>2</td><td>1,2,1,4,2</td><td>6,7,6,5</td><td>4,3,6,4,3</td></tr><tr><td>3</td><td>3,2,3,3,4</td><td>2,1,2,3</td><td>5,6,4,5,5</td></tr></table>
With the help of Two-way ANOVA provide F statistics.</td><td>20</td><td>CO4</td></tr>
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