UNITED INSTITUTE OF TECHNOLOGY

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

AD8403 – DATA ANALYTICS

UNIT - IV

<table>
<tr><th colspan="2">Part – A</th></tr>
<tr><td>1</td><td>What do you mean by Analysis of Variance?</td></tr>
<tr><td>2</td><td>Formulate Real Time Applications of z-score, t-score and f-score</td></tr>
<tr><td>3</td><td>Identify the Test which proposed for testing more than two population means</td></tr>
<tr><td>3</td><td>Identify how f-test helps to retain or reject Null Hypothesis</td></tr>
<tr><td>4</td><td>Fill up the following
If the null hypothesis is true, both the numerator and denominator of the F ratio would reflect only……. . If the null hypothesis is false, the numerator of the F ratio would also reflect the …….. If the null hypothesis is false because of a large treatment effect, the value of F would tend to be considerably larger than……</td></tr>
<tr><td>5</td><td>Find the critical values for the following F tests:
(a) α = .05, dfbetween = 1, dfwithin = 18
(b) α = .01, dfbetween = 3, dfwithin = 56
(c) α = .05, dfbetween = 2, dfwithin = 36
(d) α = .05, dfbetween = 4, dfwithin = 95</td></tr>
<tr><td>6</td><td>Find the approximate p-value for the following observed F ratios, where the numbers in parentheses refer to the degrees of freedom in the numerator and denominator, respectively.
(a) F (2, 11) = 4.56
(b) F (1, 13) = 4,76
(c) F (3, 20) = 2.92
(d) F (2, 29) = 3.66</td></tr>
<tr><td>7</td><td>Write down the Formula for estimating Effect Size based on ANOVA factor</td></tr>
<tr><td>8</td><td>Write down the Formula for HSD test. Predict how Tukey’s HSD test assures to never exceed type I error during multiple comparison.</td></tr>
<tr><td>9</td><td>Write down the Formula for Standardized Effect Size, considering Cohen’s d by adapting ANOVA.</td></tr>
<tr><th colspan="2">Part – B and C</th></tr>
<tr><td>10</td><td>Imagine a simple experiment with three groups, each containing four observations. For each of the
(a)
<table>
<tr><th>GROUP 1</th><th>GROUP 2</th><th>GROUP 3</th></tr>
<tr><td>8</td><td>8</td><td>8</td></tr>
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(c)
<table>
<tr><th>GROUP 1</th><th>GROUP 2</th><th>GROUP 3</th></tr>
<tr><td>4</td><td>6</td><td>5</td></tr>
<tr><td>6</td><td>6</td><td>7</td></tr>
<tr><td>8</td><td>10</td><td>9</td></tr>
<tr><td>14</td><td>10</td><td>11</td></tr>
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whether there is</td></tr>
<tr><td>11</td><td>Distinguish between f-score if Null Hypothesis Is True and f-score if Null Hypothesis is False.</td></tr>
</table>

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Write down the Formula for the following

i. Correction Term
ii. Sum of Squares of Total
iii. Sum of Squares among Groups
iv. Sum of Squares within Groups
v. Mean of Sum of Squares among Groups
vi. Mean of Sum of Squares within Groups
vii. F ratio

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Calculate f-ratio for the following observation and conclude either retaining your Null Hypothesis or rejecting.

Low Noise			Medium Noise			Loud Noise		
Student	Questions (X)	X^2	Student	Questions (X)	X^2	Student	Questions (X)	X^2
1	10	100	5	8	64	9	4	16
2	9	81	6	4	16	10	3	9
3	6	36	7	6	36	11	6	36
4	7	49	8	7	49	12	4	16

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Calculate f-ratio for the follow observation and conclude either retaining your Null Hypothesis or rejecting.

HOURS OF SLEEP DEPRIVATION		
ZERO	TWENTY-FOUR	FORTY-EIGHT
0	3	6
4	6	8
2	6	10

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A psychologist tests whether a series of workshops on assertive training increases eye contacts initiated by shy college students in controlled interactions with strangers. A total of 32 subjects are randomly assigned, 8 to a group, to attend either zero, one, two, or three workshop sessions. The results, expressed as the number of eye contacts during a standard observation period, are shown in the table

EYE CONTACTS AS A FUNCTION OF NUMBER OF SESSIONS			
ZERO	ONE	TWO	THREE
1	2	4	7
0	1	2	1
0	2	3	6
2	4	6	9
3	4	7	10
4	6	8	12
2	3	5	8
1	3	5	7

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Given the rejection of the null hypothesis in Question 13, Tukey's HSD test can be used to identify pairs of population means that differ. Using the .05 level of significance, calculate the critical value for HSD and use it to evaluate the statistical significance of each possible mean difference. The various sample means are X0 = 1.63, X1 = 3.13, X2 = 5.00, and X3 = 7.50.

a. Estimate the standardized effect size for any significant pair of mean differences with Cohen's d.
b. Interpret the results of your analysis