Reg. No. | | | | | | | | |

G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.

UG DEGREE END SEMESTER EXAMINATIONS - APRIL 2025.
(For those admitted in June 2023 and later)

PROGRAMME AND BRANCH: B.Sc., MATHEMATICS

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
IV	PART-III	CORE-7	U23MA407	INDUSTRY MODULE-INDUSTRIAL STATISTICS

Date & Session: 28.04.2025/AN **Time : 3 hours** **Maximum: 75 Marks**

Course Outcome	Bloom's K-level	Q. No.	SECTION – A (10 X 1 = 10 Marks) Answer ALL Questions.
CO1	K1	1.	The current year quantities are taken as weights in ____ method. a) Laspeyre's b) Paasche's c) Bowley's d) Kelly's
CO1	K2	2.	Fisher's index number satisfies _____. a) time reversal test b) factor reversal test c) circular test d) all of the above.
CO2	K1	3.	Large sample theory is applicable when __. a) N = 30 b) N < 30 c) N > 30 d) none of these.
CO2	K2	4.	Rejection of null hypothesis when it is true is called ____ error. a) type I b) type II c) type III d) standard.
CO3	K1	5.	The Student's t defined by the statistic _____. a) $\frac{\bar{x}+\mu}{S/\sqrt{n}}$ b) $\frac{\bar{x}-\mu}{1/\sqrt{n}}$ c) $\frac{\bar{x}-\mu}{\sqrt{n}}$ d) $\frac{\bar{x}-\mu}{S/\sqrt{n}}$.
CO3	K2	6.	The number of degrees of freedom in a 3 x 3 contingency table is ___. a) 3 b) 4 c) 6 d) 9
CO4	K1	7.	The basic purpose of ANOVA is to test the homogeneity of ____. a) two means b) two variances c) several means d) several variances.
CO4	K2	8.	In two way classification of five rows and three columns, the error degree of freedom is ___. a) 14 b) 8 c) 2 d) 4
CO5	K1	9.	The variation in the outputs may be observed due to unskilled technicians is__. a) assignable b) non-assignable c) process control d) control chart.
CO5	K2	10.	In a production process, the proportion of defectives is analysed by ___. a) C-chart b) P-chart c) R-chart d) Mean chart.

<table>
<tr><th>Course Outcome</th><th>Bloom's K-level</th><th>Q. No.</th><th><u>SECTION – B</u> (5 X 5 = 25 Marks)
Answer <u>ALL</u> Questions choosing either (a) or (b)</th></tr>
<tr><td>CO1</td><td>K3</td><td>11a.</td><td>Calculate Bowley-Dorfish index number from the following data:
<table>
<tr><th rowspan="2">Item</th><th colspan="2">Base year</th><th colspan="2">Current year</th></tr>
<tr><th>Price</th><th>Quantity</th><th>Price</th><th>Quantity</th></tr>
<tr><td>A</td><td>6</td><td>50</td><td>10</td><td>50</td></tr>
<tr><td>B</td><td>2</td><td>100</td><td>2</td><td>120</td></tr>
<tr><td>C</td><td>4</td><td>60</td><td>6</td><td>60</td></tr>
<tr><td>D</td><td>10</td><td>30</td><td>12</td><td>25</td></tr>
</table>
(OR)</td></tr>
<tr><td>CO1</td><td>K3</td><td>11b.</td><td>Compute Marshall-Edgeworth index number from the following data:
<table>
<tr><th rowspan="2">Item</th><th colspan="2">Base year</th><th colspan="2">Current year</th></tr>
<tr><th>Price</th><th>Quantity</th><th>Price</th><th>Quantity</th></tr>
<tr><td>A</td><td>2</td><td>74</td><td>3</td><td>82</td></tr>
<tr><td>B</td><td>5</td><td>125</td><td>4</td><td>140</td></tr>
<tr><td>C</td><td>7</td><td>40</td><td>6</td><td>33</td></tr>
</table></td></tr>
<tr><td>CO2</td><td>K3</td><td>12a.</td><td>A dice is thrown 9000 times and a throw of 3 or 4 is observed 3240 times. Show that the dice cannot be regarded as an unbiased one.
(OR)</td></tr>
<tr><td>CO2</td><td>K3</td><td>12b.</td><td>A Manufacturer of ball pens claims that a certain pen he manufactures has a mean writing life of 400 pages with a standard deviation of 20 pages. A purchasing agent selects a sample of 100 pens and puts them for test. The mean writing life for the sample was 390 pages. Should the purchasing agent reject the manufactures claim at 5% level? Table value of z at 5% level is 1.96.</td></tr>
<tr><td>CO3</td><td>K4</td><td>13a.</td><td>The heights of 10 males of a given locality are found to be 175, 168, 155, 170, 152, 170, 175, 160, 160 and 165 cms. Based on this sample of 10 males, test the hypothesis that the mean height of males is 170 cms. [value of $t_{0.05}$ for 9 d.f is 2.262]
(OR)</td></tr>
<tr><td>CO3</td><td>K4</td><td>13b.</td><td>In 120 throws of a single die, the following distribution of faces was observed.
<table>
<tr><td>Face</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>Frequency</td><td>30</td><td>25</td><td>18</td><td>10</td><td>22</td><td>15</td></tr>
</table>
Can you say that the die is biased?[value of $\chi^2_{0.05}$ for 5 d.f is 11.07]</td></tr>
<tr><td>CO4</td><td>K4</td><td>14a.</td><td>What are the assumptions of ANOVA?
(OR)</td></tr>
<tr><td>CO4</td><td>K4</td><td>14b.</td><td>Write the merits and demerits of Latin square design.</td></tr>
<tr><td>CO5</td><td>K5</td><td>15a.</td><td>Write the preliminary steps involved in setting up a control procedure.
(OR)</td></tr>
<tr><td>CO5</td><td>K5</td><td>15b.</td><td>The average number of defectives in 22 sample lots of 2000 rubber belts was found to be 10%. Obtain the values for central line and control limits of P-chart.</td></tr>
</table>

<table>
<tr><th>Course Outcome</th><th>Bloom's K-level</th><th>Q. No.</th><th><u>SECTION – C</u> (5 X 8 = 40 Marks)
Answer <u>ALL</u> Questions choosing either (a) or (b)</th></tr>
<tr><td>CO1</td><td>K3</td><td>16a.</td><td>Compute i) Laspeyre's ii) Paasche's and iii) Fisher's index numbers from the following data :
<table>
<tr><th rowspan="2">Item</th><th colspan="2">Price</th><th colspan="2">Quantity</th></tr>
<tr><th>Base year</th><th>Current year</th><th>Base year</th><th>Current year</th></tr>
<tr><td>A</td><td>4</td><td>8</td><td>8</td><td>6</td></tr>
<tr><td>B</td><td>10</td><td>12</td><td>10</td><td>5</td></tr>
<tr><td>C</td><td>8</td><td>10</td><td>14</td><td>10</td></tr>
<tr><td>D</td><td>4</td><td>4</td><td>19</td><td>13</td></tr>
</table>
(OR)</td></tr>
<tr><td>CO1</td><td>K3</td><td>16b.</td><td>Construct Fisher's price index using following data and show how it satisfies the time and factor reversal tests.
<table>
<tr><th rowspan="2">Item</th><th colspan="2">Price</th><th colspan="2">Quantity</th></tr>
<tr><th>Base year</th><th>Current year</th><th>Base year</th><th>Current year</th></tr>
<tr><td>A</td><td>12</td><td>14</td><td>20</td><td>30</td></tr>
<tr><td>B</td><td>14</td><td>20</td><td>13</td><td>15</td></tr>
<tr><td>C</td><td>10</td><td>15</td><td>12</td><td>20</td></tr>
<tr><td>D</td><td>6</td><td>4</td><td>8</td><td>10</td></tr>
<tr><td>E</td><td>8</td><td>6</td><td>5</td><td>5</td></tr>
</table></td></tr>
<tr><td>CO2</td><td>K4</td><td>17a.</td><td>Twenty people were attacked by a disease and only 18 survived. Will you reject the hypothesis that the survival rate, if attacked by this disease, is 85% in favour of the hypothesis that it is more, at 5% level.
(OR)</td></tr>
<tr><td>CO2</td><td>K4</td><td>17b.</td><td>Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal, are same against that they are not, at 5% level.</td></tr>
<tr><td>CO3</td><td>K4</td><td>18a.</td><td>10 workers are selected at random from a large number of workers in a factory. The number of items produced by them on a certain day are found to be 51, 52, 53, 55, 56, 57, 58, 59, 59, 60. From this data, would it be appropriate to suggest the mean of the number of items produced in the population is 58? (5% value of t for 9 d.f is 2.262).
(OR)</td></tr>
<tr><td>CO3</td><td>K4</td><td>18b.</td><td>In an experiment on the immunization of goats from anthrax, the following results were obtained. Derive your inference on the vaccine. (Use x^2 test; value of x^2at 5% level for one degree of freedom is 3.84.)
<table>
<tr><th></th><th>Died of Anthrax</th><th>Survived</th><th>Total</th></tr>
<tr><td>Inoculated with vaccine</td><td>2</td><td>10</td><td>12</td></tr>
<tr><td>Not Inoculated</td><td>6</td><td>6</td><td>12</td></tr>
<tr><td>Total</td><td>8</td><td>16</td><td>24</td></tr>
</table></td></tr>
<tr><td>CO4</td><td>K5</td><td>19a.</td><td>The following table gives the yields of 15 samples of plot under three varieties of seed.</td></tr>
</table>

A	20	21	23	16	20
B	18	20	17	15	25
C	25	28	22	28	32

Interpret using analysis of variance whether there is a significant difference in the average yield of seeds.

(OR)

CO4 | K5 | 19b.

Perform a two-way ANOVA on the data given below:

		Treatment I		
		I	II	III
Treatment II	I	30	26	38
	II	24	29	28
	III	33	24	35
	IV	36	31	30
	V	27	35	33

Use the coding method, subtracting 30 from the given numbers. [For (8, 2) d.f $F_{0.05}$ = 19.4 ; for (8, 4) d.f $F_{0.05}$ = 6.04]

CO5 | K5 | 20a.

The following table gives the number of defective items found in 20 successive samples of 100 items each.

2	6	2	4	4	15	0	4	10	18
2	4	6	4	8	0	2	2	4	0

Judge whether the process is under control. Suggest suitable control limits for the future.

(OR)

CO5 | K5 | 20b.

You are given below the values of sample mean ($\bar{\mathbf{X}}$) and the range (R) for ten samples of size 5 each.

Sample No.	1	2	3	4	5	6	7	8	9	10
$\bar{\mathbf{X}}$	43	49	37	44	45	37	51	46	43	47
R	5	6	5	7	7	4	8	6	4	6

Evaluate the values for the central line and the control limits for $\bar{\mathbf{X}}$-chart and R-chart and then comment on the state of control. [$\mathbf{A_2}$ = 0.58, $\mathbf{D_3}$ = 0, $\mathbf{D_4}$ = 2.115].