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



## UG DEGREE END SEMESTER EXAMINATIONS - NOVEMBER 2024.

(For those admitted in June 2023 and later)

## PROGRAMME AND BRANCH: B.Sc., STATISTICS

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
III	PART - III	ELECTIVE GENERIC - 3	U23ST3A3	NUMERICAL METHODS

Date &amp; Session: 14.11.2024 / 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.	What is the order of convergence of Newton Raphson Method is _____. a) atleast 2      b) atmost 2      c) $h^2$ d) $h^4$
CO1	K2	2.	Write the condition for a root of $f(x) = 0$ lie between a & b. a) $f(a) > 0, f(b) < 0$ b) $f(a) < 0, f(b) < 0$ c) $f(a) > 0, f(b) > 0$ d) $f(a) < 0, f(b) > 0$
CO2	K1	3.	Select the initial values of unknown variables in Gauss Jacobi Method. a) 0      b) 1      c) -1      d) 2
CO2	K2	4.	In Gauss elimination method, the given system is transferred to _____ matrix. a) lower triangular      b) upper triangular      c) diagonal      d) square
CO3	K1	5.	Estimate the range of p in Gauss backward interpolation formula. a) -1 & 1      b) -1 & 0      c) 0 & 1      d) none
CO3	K2	6.	Which formula involves odd difference below the central line and even difference on the central line? a) Gauss forward      b) Gauss backward      c) Stirling      d) Bessel
CO4	K1	7.	What is the value [a,b] if $f(x) = \frac{1}{x^2}$ . a) $\frac{a^2b^2}{a+b}$ b) $-\frac{a+b}{a^2b^2}$ c) $\frac{1}{a^2} - \frac{1}{b^2}$ d) 0
CO4	K2	8.	For unevenly spaced points we use _____ formula. a) Newton      b) Gauss      c) Bisection      d) Lagrange
CO5	K1	9.	Choose the right one. a) $y'' = \frac{1}{h} [\Delta^2 y_0 - \Delta^3 y_0 + \frac{11}{12} \Delta^4 y_0 + \dots]$ b) $y'' = \frac{1}{h} [\Delta y_0 - \Delta^2 y_0 + \frac{5}{6} \Delta^3 y_0 + \dots]$ c) $y'' = \frac{1}{h^2} [\Delta y_0 - \Delta^2 y_0 + \frac{5}{6} \Delta^3 y_0 + \dots]$ d) $y'' = \frac{1}{h^2} [\Delta^2 y_0 - \Delta^3 y_0 + \frac{11}{12} \Delta^4 y_0 + \dots]$
CO5	K2	10.	The error in simpson's one third rule is of order. a) $h^2$ b) $h^3$ c) $h^4$ d) none
Course Outcome	Bloom's K-level	Q. No.	SECTION - B (5 X 5 = 25 Marks) Answer ALL Questions choosing either (a) or (b)
CO1	K3	11a.	Make use of iteration method to find the exact root of $x^3 - 3x + 1 = 0$ <b>(OR)</b>
CO1	K3	11b.	Solve for the exact root of $x^3 + 3x - 1 = 0$ by using Newton Raphson Method.
CO2	K3	12a.	Discover the values of x,y, z of the equation $6x + 15y + 2z = 72$ , $x + y + 54z = 110$ , $27x + 6y - z = 85$ using Gauss seidal method. <b>(OR)</b>
CO2	K3	12b.	Calculate the value of x, y and z of the equation $5x - 2y + 3z = 18$ , $x + 7y - 3z = -22$ , $2x - y + 6z = 22$ using Gauss Jordan method.

CO3	K4	13a.	Examine the value of $f(30)$ using Gauss forward interpolation formula.										
			<table border="1"> <tr> <td>X</td> <td>21</td> <td>25</td> <td>29</td> <td>33</td> <td>37</td> </tr> <tr> <td>Y</td> <td>18.4708</td> <td>17.8144</td> <td>17.1070</td> <td>16.3432</td> <td>15.5154</td> </tr> </table> <p style="text-align: center;"><b>(OR)</b></p> <td>Infer the value of <math>y(25)</math> using Laplace Everett's formula.</td>	X	21	25	29	33	37	Y	18.4708	17.8144	17.1070
X	21	25	29	33	37								
Y	18.4708	17.8144	17.1070	16.3432	15.5154								
CO3	K4	13b.	<table border="1"> <tr> <td>x</td> <td>20</td> <td>24</td> <td>28</td> <td>32</td> </tr> <tr> <td>y</td> <td>2854</td> <td>3162</td> <td>3544</td> <td>3992</td> </tr> </table>	x	20	24	28	32	y	2854	3162	3544	3992
			x	20	24	28	32						
y	2854	3162	3544	3992									
CO4	K4	14a.	Analyze the divided difference table for the function $f(x) = x^2 + 2x + 2$ whose arguments are 1, 2, 4, 7, 10.										
CO4	K4	14b.	Inspect the value of $y$ at $x = 6$ by using Lagrange method.										
			<table border="1"> <tr> <td>x</td> <td>3</td> <td>7</td> <td>9</td> <td>10</td> </tr> <tr> <td></td> <td>168</td> <td>120</td> <td>72</td> <td>63</td> </tr> </table>	x	3	7	9	10		168	120	72	63
x	3	7	9	10									
	168	120	72	63									
CO5	K5	15a.	Predict the value of $\int_0^{10} \frac{dx}{1+x^2}$ by applying Trapezoidal rule and Simpson one third rule.										
CO5	K5	15b.	Assess the value of $\int_0^1 \frac{x^2}{1+x^3} dx$ using Simpson one-third rule by taking $h = 0.25$ . Also find $\log 2^{1/3}$ .										

Course Outcome	Bloom's K-level	Q. No.	<b>SECTION - C (5 X 8 = 40 Marks)</b> <b>Answer ALL Questions choosing either (a) or (b)</b>														
CO1	K3	16a.	Apply bisection method to find the root of $x^3 - x - 11 = 0$ .														
CO1	K3	16b.	Identify the root of $\sqrt{12}$ using Newton Raphson method.														
CO2	K4	17a.	Conclude the value of $x, y, z$ by Gauss by Jacobi method $3x + 4y + 15z = 54.8$ , $x + 12y + 3z = 39.66$ , $10x + y - 2z = 7.74$ .														
CO2	K4	17b.	Estimate the value of $y$ at $x = 48$ and $x = 84$ from following data using Newton Interpolation formula.														
			<table border="1"> <tr> <td>x</td> <td>40</td> <td>50</td> <td>60</td> <td>70</td> <td>80</td> <td>90</td> </tr> <tr> <td>y</td> <td>184</td> <td>204</td> <td>226</td> <td>250</td> <td>276</td> <td>304</td> </tr> </table>	x	40	50	60	70	80	90	y	184	204	226	250	276	304
x	40	50	60	70	80	90											
y	184	204	226	250	276	304											
CO3	K4	18a.	Comment the value of the specific heat corresponding to $15^\circ\text{C}$ and $45^\circ\text{C}$ from following data.														
			<table border="1"> <tr> <td>Temperature</td> <td>0</td> <td>10</td> <td>20</td> <td>30</td> <td>40</td> <td>50</td> </tr> <tr> <td>Specific heat</td> <td>0.51</td> <td>0.55</td> <td>0.57</td> <td>0.59</td> <td>0.62</td> <td>0.67</td> </tr> </table> <p style="text-align: center;"><b>(OR)</b></p>	Temperature	0	10	20	30	40	50	Specific heat	0.51	0.55	0.57	0.59	0.62	0.67
Temperature	0	10	20	30	40	50											
Specific heat	0.51	0.55	0.57	0.59	0.62	0.67											
CO3	K4	18b.	Conclude the value of $y_{35}$ using Stirling formula, given that $y_{10} = 600$ , $y_{20} = 512$ , $y_{30} = 439$ , $y_{40} = 346$ , $y_{50} = 243$ .														
CO4	K5	19a.	Select Newton divided difference formula to detect the value of $y_9$ from the data given below.														
CO4	K5	19b.	<table border="1"> <tr> <td>x</td> <td>5</td> <td>7</td> <td>11</td> <td>13</td> <td>17</td> </tr> <tr> <td>y</td> <td>150</td> <td>392</td> <td>1452</td> <td>2366</td> <td>5202</td> </tr> </table> <p style="text-align: center;"><b>(OR)</b></p> <td>Judge the value of <math>x</math> using inverse interpolation formula correct to one decimal place for which <math>y = 7</math>.</td>	x	5	7	11	13	17	y	150	392	1452	2366	5202	Judge the value of $x$ using inverse interpolation formula correct to one decimal place for which $y = 7$ .	
x	5	7	11	13	17												
y	150	392	1452	2366	5202												
			<table border="1"> <tr> <td>x</td> <td>1</td> <td>3</td> <td>4</td> </tr> <tr> <td>y</td> <td>4</td> <td>12</td> <td>19</td> </tr> </table>	x	1	3	4	y	4	12	19						
x	1	3	4														
y	4	12	19														
CO5	K5	20a.	Assess the value of first and second derivative of $y$ at $x = 500$ and $x = 550$ from following data.														
			<table border="1"> <tr> <td>x</td> <td>500</td> <td>510</td> <td>520</td> <td>530</td> <td>540</td> <td>550</td> </tr> <tr> <td>y</td> <td>6.2146</td> <td>6.2344</td> <td>6.2538</td> <td>6.2729</td> <td>6.2916</td> <td>6.3099</td> </tr> </table> <p style="text-align: center;"><b>(OR)</b></p>	x	500	510	520	530	540	550	y	6.2146	6.2344	6.2538	6.2729	6.2916	6.3099
x	500	510	520	530	540	550											
y	6.2146	6.2344	6.2538	6.2729	6.2916	6.3099											
CO5	K5	20b.	Evaluate $\int_0^1 \frac{dx}{1+x}$ using (i) trapezoidal rule (ii) Simpson one-third rule (iii) Simpson three-eighth rule. Find error in each case.														