

Hall Ticket Number:

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Code No. : 14143

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. IV-Semester Main & Backlog Examinations, July-2022

Numerical Methods, Probability & Statistics

(Common to Civil, EEE & Mech.Engg.)

Time: 3 hours

Max. Marks: 60

- Note: 1. Answer all questions from **Part-A** and any **FIVE** from **Part-B**
2. Provide normal, *t*, *f* and Chi-square tables

Q. No.	Stem of the question	M	L	CO	PO												
1.	Give the Newton's forward interpolation formula? Can we use it for unequally spaced intervals?	2	1	1	1,12												
2.	Find the cubic polynomial from the following data <table border="1" style="margin: 5px auto;"> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td>F(x)</td> <td>1</td> <td>2</td> <td>1</td> <td>10</td> </tr> </table>	x	0	1	2	3	F(x)	1	2	1	10	2	3	1	1,12		
x	0	1	2	3													
F(x)	1	2	1	10													
3.	Write a Taylors formula to solve ordinary differential equations	2	1	2	1,12												
4.	Write the formulae of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ by using Newton's Forward Interpolation formula.	2	2	2	1,12												
5.	Explain the formula of probability density function of Continuous random variable.	2	2	3	1,12												
6.	Write any two applications of normal distribution.	2	1	3	1,12												
7.	Define the T-test formula and when to use it?	2	1	4	1,12												
8.	Explain chi-square test and identify its limitations?	2	2	4	1,12												
9.	Define the Karl Pearson Correlation Coefficient.	2	1	5	1,12												
10.	Write the normal equations of a straight line.	2	2	5	1,12												
Part-B (5×8 = 40 Marks)																	
11. a)	Find the solution of $x = 1895$ using Newton's Forward Difference formula <table border="1" style="margin: 5px auto;"> <tr> <td>x</td> <td>f(x)</td> </tr> <tr> <td>1891</td> <td>46</td> </tr> <tr> <td>1901</td> <td>66</td> </tr> <tr> <td>1911</td> <td>81</td> </tr> <tr> <td>1921</td> <td>93</td> </tr> <tr> <td>1931</td> <td>101</td> </tr> </table>	x	f(x)	1891	46	1901	66	1911	81	1921	93	1931	101	4	2	1	1,2,12
x	f(x)																
1891	46																
1901	66																
1911	81																
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1931	101																

Contd... 2

b)	Find the Solution of $x = 301$ using Lagrange's Interpolation formula	4	2	1	1,2,12																					
<table border="1"> <thead> <tr> <th>x</th> <th>f(x)</th> </tr> </thead> <tbody> <tr> <td>300</td> <td>2.4771</td> </tr> <tr> <td>304</td> <td>2.4829</td> </tr> <tr> <td>305</td> <td>2.4843</td> </tr> <tr> <td>307</td> <td>2.4871</td> </tr> </tbody> </table>		x	f(x)	300	2.4771	304	2.4829	305	2.4843	307	2.4871															
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12. a)	Define the Euler's method for solving differential equations?	2	1	2	1,12																					
b)	Solve the following problems using Euler's method with step size of $h = 0.2$, Compute an approximate value of y at $x = 1$, $y' = x + y$, $y(0) = 0$.	6	2	2	1,2,12																					
13. a)	Most graduate schools of business require applicants for admission to take the Graduate Management Admission Council's GMAT examination. Scores on the GMAT are roughly normally distributed with a mean of 527 and a standard deviation of 112. What is the probability of an individual scoring above 500 on the GMAT?	3	3	3	1,2,12																					
b)	A random variable X has the following probability distribution function. Find K , hence find $P(X < 4)$	5	3	3	1,2,12																					
<table border="1"> <thead> <tr> <th>x</th> <th>0</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr> <td>P(x)</td> <td>k</td> <td>3k</td> <td>5k</td> <td>7k</td> <td>9k</td> <td>11k</td> <td>13k</td> </tr> </tbody> </table>		x	0	1	2	3	4	5	6	P(x)	k	3k	5k	7k	9k	11k	13k									
x	0	1	2	3	4	5	6																			
P(x)	k	3k	5k	7k	9k	11k	13k																			
14. a)	Explain various errors in hypothesis testing.	2	2	4	1,12																					
b)	An inventor has developed a new, energy-efficient lawn mower engine. He claims that the engine will run continuously for more than 5 hours (300 minutes) on a single gallon of regular gasoline. (The leading brand lawnmower engine runs for 300 minutes on 1 gallon of gasoline.) From his stock of engines, the inventor selects a simple random sample of 50 engines for testing. The engines run for an average of 305 minutes. The true standard deviation σ is known and is equal to 30 minutes, and the run times of the engines are normally distributed. Test hypothesis that the mean run time is more than 300 minutes. Use a 0.05 level of significance.	6	3	4	1,2,12																					
15. a)	Fit a second order polynomial to the following data by the method of least squares.	6	2	5	1,2,12																					
<table border="1"> <thead> <tr> <th>i</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr> <td>x</td> <td>0</td> <td>0.5</td> <td>1.0</td> <td>1.5</td> <td>2.0</td> <td>2.5</td> </tr> <tr> <td>y</td> <td>0</td> <td>0.25</td> <td>1.0</td> <td>2.25</td> <td>4.0</td> <td>6.25</td> </tr> </tbody> </table>		i	1	2	3	4	5	6	x	0	0.5	1.0	1.5	2.0	2.5	y	0	0.25	1.0	2.25	4.0	6.25				
i	1	2	3	4	5	6																				
x	0	0.5	1.0	1.5	2.0	2.5																				
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b)	Explain different curve fitting techniques?	2	2	5	1,12																					

16. a)	Use Lagrange's formula, to find the quadratic polynomial that takes the values	4 2 1 1,2,12															
<table border="1"> <tr> <td>x</td> <td>0</td> <td>1</td> <td>3</td> </tr> <tr> <td>f(x)</td> <td>0</td> <td>1</td> <td>0</td> </tr> </table>			x	0	1	3	f(x)	0	1	0							
x	0	1	3														
f(x)	0	1	0														
b)	Apply Runge-Kutta method of 4 th order to find an approximate value of y when x = 0.2 given that $\frac{dy}{dx} = x + y$ and y = 1 when x = 0 taking step size h = 0.2.	4 2 2 1,2,12															
17.	Answer any <i>two</i> of the following:																
a)	Define the different types of Discrete random variable? How to find their variances	4 1 3 1,2															
b)	The nine items of a sample have the following values 45, 47, 50,52,48,47,49,53,51. Does the mean of these differ significantly from the assumed mean of 47.5?	4 2 4 1,2,12															
c)	Find the Karl Pearson correlation coefficient from below data and draw the conclusions	4 3 5 1,2,12															
<table border="1"> <thead> <tr> <th>Person</th> <th>Age (X)</th> <th>Income (Y)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20</td> <td>1500</td> </tr> <tr> <td>2</td> <td>30</td> <td>3000</td> </tr> <tr> <td>3</td> <td>40</td> <td>5000</td> </tr> <tr> <td>4</td> <td>50</td> <td>7500</td> </tr> </tbody> </table>			Person	Age (X)	Income (Y)	1	20	1500	2	30	3000	3	40	5000	4	50	7500
Person	Age (X)	Income (Y)															
1	20	1500															
2	30	3000															
3	40	5000															
4	50	7500															

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	37%
iii)	Blooms Taxonomy Level – 3 & 4	43%
