Hall Ticket Number:

Code No. : 14122

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CBCS) IV-Semester Main Examinations, January-2021

Numerical Methods, Probability and Statistics

(Common to Civil, EEE & Mech.)

Time: **2** hours

Max. Marks: **60**

Note: Answer any NINE questions from Part-A and any THREE from Part-B

Part-A (9 × 2 = 18 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Evaluate $\Delta^2\left(e^x\right)$, taking $h=1$.	2	2	1	1,12
2.	Find the second divided difference of $f(x)=\frac{1}{x}$ using the points a,b,c.	2	2	1	1,12
3.	Write the expressions for $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ using Newton's backward interpolation formula.	2	1	2	1,12
4.	Using Euler's method, find the approximate value of $y(0.1)$ for the initial value problem $y'=x^2+y^2, y(0)=1$.	2	3	2	1,12
5.	Define discrete and continuous random variables with an example.	2	1	3	1,12
6.	If the probability density function of a continuous random variable X is $f(x)=ae^{-\lvert x\rvert}, -\infty<x<\infty$, then find the value of a.	2	2	3	1,12
7.	Define (i) null hypothesis and (ii) alternate hypothesis.	2	1	4	1,12
8.	Write short note on type I and type II errors.	2	1	4	1,12
9.	Test whether the equations $x=4y+5$ and $y=\frac{1}{8}x+4$ represent valid regression lines.	2	2	5	1,12
10.	Show that the coefficient of correlation is the geometric mean of regression coefficients.	2	2	5	1,12
11.	State Lagrange's interpolation formula.	2	1	1	1,12
12.	Write Runge-Kutta method of fourth order formula.	2	1	2	1,12
	Part-B (3 × 14 = 42 Marks)				
13. a)	Find $f(x)$ by Newton's forward and backward interpolation formulae from the following data: x : 1, 2, 3, 4 f(x): -1, -1, 1, 5	7	3	1	1,12
b)	If $y_1=168$, $y_7=192$, $y_{15}=336$, then find y_{10} using Lagrange's interpolation formula.	7	3	1	1,12

Data for 13. a):

x :	1	2	3	4
f(x):	-1	-1	1	5

Contd... 2

14. a) Find $\frac{dy}{dx}$ and $\frac{d^2 y}{dx^2}$ at $x = 0.0$ from the following data: 7 2 2 1,12

x:	0.0	0.2	0.4	0.6	0.8	1.0
y:	0.0	0.12	0.48	1.10	2.0	3.20

b) Apply Taylor's series method to find the approximate value of y(0.1) for the initial value problem $y' = x^2 y - 1,\ y(0) = 1$. 7 3 2 1,12

15. a) A random variable X has the following probability distribution. 7 2 3 1,12

X:	0	1	2	3	4
P(X):	3k	3k	K	2k	6k

Find (i) k (ii) E(X) (iii) Var(X) (iv) $P(X < 2)$

b) The random variable X is normally distributed with mean 9 and standard deviation 3. Find the probabilities that (i) $X \geq 15$ and (ii) $0 \leq X \leq 9$. 7 3 3 1,12

16. a) A random sample of 7 students had the following I.Q's: 7 4 4 1,12

85, 96, 105, 102, 82, 89, 90.

Does this data support the claim of a population mean of I.Q 100 ? Test at 5% level of significance.

b) Two samples of sizes 9 and 8 give the sum of squares of deviations from their respective means equals to 160 and 91 respectively. Can these be regarded as drawn from the same normal population? 7 4 4 1,12

17. a) Use the method of least squares to fit a straight line $y = a + bx$ for the following data: 7 2 5 1,12

x:	0	2	5	7
y:	-1	5	12	20

b) Compute the coefficient of correlation between X and Y from the following data: 7 2 5 1,12

X	1	2	3	4	5	6	7	8	9
Y	12	11	13	15	14	17	16	19	10

Also , find the regression line of x on y.

18. a) Using Newton's divided difference formula, find f(8) and f(12) from the following data: 7 3 1 1,12

x:	4	5	7	10	11	13
f(x):	48	100	294	900	1210	2028

b) Use Runge-Kutta method of order 4 to find the approximate value of $y(1.2)$ for $y' = x^2 + y^2,\ y(1) = 2$ with h = 0.1. 7 3 2 1,12

19. Answer any ***two*** of the following:

a) If X is a discrete random variable, then prove that E (aX+b) = aE (X + b) andVar (aX+b) = a^2 Var (X), where a and b are constants. 7 2 3 1,12

b) In experiments on pea breeding, the following frequencies of seeds were obtained: 7 3 4 1,12

Round and Yellow	Wrinkled and Yellow	Round and Green	Wrinkled and Green	Total
315	101	108	32	556

Theory predicts that the frequencies should be in 9:3:3:1. Examine the correspondence between theory and experiment.

c) If $x=4y+5$ and $y=kx+4$ are the regression lines of x on y and y on x respectively, show that $0<4k<1$ and if $k=\frac{1}{20}$, find $\bar{x}$ *and* $\bar{y}$. 7 3 5 1,12

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

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	44.88
2	Knowledge on application and analysis (Level-3 & 4)	55.12
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable, subject to a maximum of 10%)	0

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