Hall Ticket Number:

Code No. : 14164 AS N

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. IV-Semester Advanced Supplementary Examinations, Aug./Sept.-2023

Numerical Methods, Probability and Statistics

(Common to Civil, EEE & Mech.)

Time: **3 hours** Max. Marks: **60**

Note: Tables of Area under the normal curves, t-test, F-test & Chi-square test will be provided

Answer all questions from ***Part-A*** *and any* ***FIVE*** *from* ***Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Prove that $\Delta = E - 1$.	2	2	1	1,2,12
2.	Write Lagrange's interpolation formula.	2	1	1	1,2,12
3.	State Newton's forward interpolation formula for first and second derivative at $x = x_0$	2	1	2	1,2,12
4.	Using Euler's method, find the approximate value of $y(0.2)$ for the initial value problem $\frac{dy}{dx} = y + e^x, y(0) = 0$.	2	2	2	1,2,12
5.	Define Discrete and continuous random variable.	2	1	3	1,2,12
6.	Define Normal distribution.	2	1	3	1,2,12
7.	Define type-I and type-II errors.	2	1	4	1,2,12
8.	Write the applications of Chi-square test.	2	2	4	1,2,12
9.	Write the principle of least squares and the normal equations to fit the parabola.	2	2	5	1,2,12
10.	Define Correlation and coefficient of correlation.	2	1	5	1,2,12

Part-B (5×8 = 40 Marks)

11. a) Given $\sin 45° = 0.7071$, $\sin 50° = 0.7660$, $\sin 55° = 0.8192$, $\sin 60° = 0.8660$, find $\sin 46°$ using Newton's forward formula. — 4 3 1 1,2,12

b) Obtain the Newton's divided difference interpolation polynomial and hence find $f(6)$: — 4 3 1 1,2,12

x	3	7	9	10
f(x)	168	120	72	63

12. a) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.25$ from the following table. — 4 3 2 1,2,12

X	1	1.05	1.10	1.15	1.20	1.25	1.30
y	1	1.025	1.049	1.072	1.095	1.118	1.140

b) Using Runge – Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2$. — 4 3 2 1,2,12

13. a) A random variable X has the following probability distribution. — 4 2 3 1,2,12

$X=x_i$	0	1	2	3	4
$P(X=x_i)$	c	$2c$	$3c$	$2c^2$	$5c^2$

Find (i) c, (ii)$P(X \geq 2)$, (iii) $P(X < 4)$ and (iv)$P(0 < X < 4)$.

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b)	If X is a continuous random variable with probability density function given by $f(x) = \begin{cases} kx, 0 \le x < 2 \\ 2k, 2 \le x < 4 \\ -kx + 6k, 4 \le x < 6 \end{cases}$, then find k and mean of X.	4	2	3	1,2,12
14. a)	A random sample of 10 boys had the following I.Q.: 70, 120, 110, 101, 88, 83, 95, 98, 107, and 100. Do these data support the assumption of a population mean I.Q. of 100? Test at 5% level of significance.	4	3	4	1,2,12
b)	Two random samples of sizes 7 and 8 gave the following values of the variable. Sample 1: 55 49 65 60 56 59 54 Sample 2: 45 69 70 49 54 57 59 48 Test the difference of the estimates of the population variances at 5% level of significance.	4	3	4	1,2,12
15. a)	Find the straight line that best fits the following data x: 1 2 3 4 5 y: 0.25 0.42 0.56 0.72 1	4	2	5	1,2,12
b)	Find the coefficient of correlation from the following data: x: 78 90 97 70 60 79 68 58 y: 125 136 155 111 106 137 122 108	4	3	5	1,2,12
16. a)	Find f (43) from the following data using Newton's backward interpolation formula: x: 20 25 30 35 40 45 f(x): 354 332 291 260 231 204	4	3	1	1,2,12
b)	Find by Taylor's series method, the values of y at $x = 0.1$ and $x = 0.2$ to four decimal places from $\frac{dy}{dx} = x^2y - 1$ with $y(0) = 1$.	4	3	2	1,2,12
17.	Answer any ***two*** of the following:				
a)	The mean and standard deviation of the marks obtained by 1000 students in an examination are respectively 34.4 and 16.5. Assuming the normality of the distribution, find the approximate number of students expected to obtain marks (i) between 30 and 60 (ii) less than 45.	4	3	3	1,2,12
b)	Define (i) Null hypothesis, (ii) Alternative hypothesis, (iii) Level of significance and (iv) Confidence limits.	4	1	4	1,2,12
c)	Obtain the least squares approximation of the form $y = ae^{bx}$ to the following data x: 0.1 0.2 0.3 0.4 0.5 0.6 y: 0.76 0.58 0.44 0.35 0.29 0.18	4	2	5	1,2,12

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

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	30%
iii)	Blooms Taxonomy Level – 3 & 4	50%

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