Hall Ticket Number:

Code No. : 14264 AS N

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
Accredited by NAAC with A++ Grade
B.E. IV-Semester Advanced Supplementary Examinations, Aug./Sept.-2023
Transform Techniques, Probability & Statistics
(Common to CSE & AIML)

Time: **3 hours**

Max. Marks: **60**

Note: Tables of Area under the normal curves, t-test, F-test & Chi-square test will be provided
*Note: 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.	Determine the Fourier coefficient a_6 in the Fourier series expansion of $f(x) = x^5 + x^3$ in $(-2,2)$.	2	1	1	1,12
2.	State Dirichlet's conditions for existence of Fourier series.	2	1	1	1,12
3.	State Fourier integral theorem.	2	1	2	1,12
4.	Find the Fourier transform of $f(x) = \begin{cases} x, & \lvert x \rvert \le 1 \\ 0, & \lvert x \rvert > 1 \end{cases}$.	2	1	2	1,12
5.	A random variable X has the following distribution..	2	1	3	1,12

X	0	1	2	3	4
$P(X)$	C	$2C$	$2C$	C	$4C$

Find $P(1 < X < 4)$.

Q. No.	Stem of the question	M	L	CO	PO
6.	If X is a discrete random variable, prove that $E(kX+c) = k\,E(X + c)$.	2	2	3	1,12
7.	Define Type-I and Type-II errors.	2	1	4	1,12
8.	Write about level of significance.	2	1	4	1,12
9.	Define Correlation.	2	1	5	1,12
10.	Write the normal equations of the parabola $y = ax^2 + bx + c$	2	1	5	1,12

Part-B (5×8 = 40 Marks)

Q. No.	Stem of the question	M	L	CO	PO
11.	Find the Fourier series for $f(x) = x^2$ in $[-\pi, \pi]$. Hence find the sums $\sum_{n=1}^{\infty} \frac{1}{n^2}$ and $\sum_{n=1}^{\infty} \frac{1}{(2n-1)^2}$.	8	2	1	1,12

		M	L	CO	PO
12.	Find the Fourier sine and cosine transforms of $f(x) = e^{-|x|} + 2e^{-2|x|}$.	8	2	1	1,12
13.	A sample of 100 dry battery cells are tested to find the length of life produced the following results: $$\bar{x} = 12 \text{ hours and } \sigma = 3 \text{ hours}$$ Assuming the data to be normally distributed , what percentage of battery cells are expected to have life (i) more than 15 hours? (ii) less than 6 hours ? and (iii) between 10 and 14 hours ?	8	3	3	1,2

14. Two random samples drawn from two normal populations have the variable values as below: 8 3 4 1,12

Sample I	19	17	16	28	22	23	19	24	26	-	-	-
Sample II	28	32	40	37	30	35	40	28	21	45	30	36

Find the estimate of the variance of the population and test whether the two populations have the same variance. Use 5% level of significance.

		M	L	CO	PO
15.	Find the correlation coefficient for the following data.	8	3	5	1,12

x	6	5	8	8	7	6	10	4	9	7
y	8	7	7	10	5	8	10	6	8	6

		M	L	CO	PO
16. a)	Find the Fourier cosine series for $f(x) = x$ in $[0, \pi]$.	4	3	1	1,12
b)	If $F\{f(x)\} = F(s)$, then show that $F\{f(x)\cos ax\} = \dfrac{1}{2}[F(s+a) + F(s-a)]$.	4	3	2	1,12

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

		M	L	CO	PO
a)	A continuous random variable X has the p.d.f. $f(x) = \begin{cases} k(x - x^2), & 0 \le x \le 1 \\ 0 & \text{otherwise} \end{cases}$. Find (i) k and (ii) $V(2X)$.	4	3	3	1,12
b)	A random sample of 10 boys had the following I.Q's: 70,120,110,101,88,83,95,98,107 and 100. Does this data support the assumption of population mean of I.Q of 100? Test at 5% level of significance.	4	3	4	1,12
c)	Using the method of least squares, fit a second degree parabola to the following data:	4	2	5	1,12

x	0	1	2	3	4
y	0	1.8	1.3	2.5	6.3

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

i)	Blooms Taxonomy Level – 1	22.5%
ii)	Blooms Taxonomy Level – 2	27.5%
iii)	Blooms Taxonomy Level – 3 & 4	50%

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