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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 $f(x) = \begin{cases} x, & x \leq 1 \\ 0, & x > 1 \end{cases}$.	2	1	2	1,12												
5.	A random variable X has the following distributio..	2	1	3	1,12												
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>$P(X)$</td> <td>C</td> <td>$2C$</td> <td>$2C$</td> <td>C</td> <td>$4C$</td> </tr> </table>	X	0	1	2	3	4	$P(X)$	C	$2C$	$2C$	C	$4C$				
X	0	1	2	3	4												
$P(X)$	C	$2C$	$2C$	C	$4C$												
	Find $P(1 < X < 4)$.																
6.	If X is a discrete random variable, prove that $E(kX+c) = kE(X+c)$.	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)																
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												

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: 8 3 3 1,2

$$\bar{x} = 12 \text{ hours and } \sigma = 3 \text{ hours}$$

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?

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

Sample I	1	1	1	2	2	2	1	2	2	-	-	-
	9	7	6	8	2	3	9	4	6			
Sample II	2	3	4	3	3	3	4	2	4	4	3	3
	8	2	0	7	0	5	0	8	1	5	0	6

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

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

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 $F\{f(x)\cos ax\} = \frac{1}{2}[F(s+a) + F(s-a)]$. 4 3 2 1,12

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

a) A continuous random variable X has the p.d.f. $f(x) = \begin{cases} k(x-x^2), & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$. 4 3 3 1,12

Find (i) k and (ii) $V(2X)$.

b) A random sample of 10 boys had the following I.Q's: 70,120,110,101,88,83,95,98,107 and 100. 4 3 4 1,12

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

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%