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Code No. : 14263 N

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. IV-Semester Main & Backlog Examinations, July-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.	Give an example of a function with justification, which doesn't satisfy any one of the Dirichlet's conditions of a Fourier series.	2	1	1	1,12
2.	If $f(x) = \sqrt{1 - \cos x}$, $0 < x < 2\pi$ then determine the Fourier Co-efficient a_0 .	2	1	1	1,12
3.	State and prove Shifting property of Fourier Transforms.	2	1	2	1,12
4.	Define Fourier Sine and cosine Transforms of $f(x)$.	2	1	2	1,12
5.	Define Discrete Random variable with a real life examples.	2	1	3	1,12
6.	Find c for the continuous random variable X whose p. d. f is given by $f(x) = \begin{cases} cx(2-x), & \text{if } 0 \leq x \leq 2 \\ 0, & \text{otherwise} \end{cases}$ where c is a constant.	2	2	3	1,12
7.	Write any two properties of t-distribution.	2	1	4	1,12
8.	Define Level of Significance.	2	1	4	1,12
9.	Define Correlation.	2	1	5	1,12
10.	Write the normal equations of the Parabola $R = aV^2 + bV + c$.	2	1	5	1,12
Part-B (5 × 8 = 40 Marks)					
11. a)	Obtain Fourier series for the function $f(x) = \begin{cases} \pi x, & 0 \leq x \leq 1 \\ \pi(2-x), & 1 \leq x \leq 2 \end{cases}$	4	2	1	1,12
b)	Given $f(x) = \cos x $, expand $f(x)$ as a Fourier series in the interval $(-\pi, \pi)$.	4	2	1	1,12
12. a)	Find the Fourier Sine Transform of $\frac{e^{-ax}}{x}$	3	2	2	1,12
b)	Find the Fourier Transform of $f(x) = \begin{cases} 1 & \text{for } x < 1 \\ 0 & \text{for } x > 1 \end{cases}$ and hence evaluate $\int_0^{\infty} \frac{\sin x}{x} dx$	5	2	2	1,12
13. a)	The density functions of a random variable X is $f(x) = \begin{cases} e^{-x}, & x \geq 0 \\ 0, & \text{otherwise} \end{cases}$ Find $E(X)$, $E(X^2)$ & $V(X)$.	4	3	3	1,12

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b)	A Random variable gives measurements X between 0 & 1 with a probability function $f(x) = \begin{cases} 12x^3 - 21x^2 + 10x, & 0 \leq x \leq 1 \\ 0, & \text{elsewhere} \end{cases}$ Find i) $P(X \leq \frac{1}{2})$ and $P(X \geq \frac{1}{2})$ ii) Find a number $k \ni P(X \leq k) = \frac{1}{2}$.	4	2	3	1,12																		
14. a)	The heights of 10 males of a given locality are found to be 70,67,62,68,61,68,70,64,64,66 inches. Is it reasonable to believe that the average height is greater than 64 inches? Test at 5% significant level.	4	3	4	1,12																		
b)	A die is thrown 264 times with the following results.	4	2	4	1,12																		
<table border="1"> <tbody> <tr> <td>No. appeared on the die</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> </tr> <tr> <td>Frequency</td> <td>40</td> <td>32</td> <td>28</td> <td>58</td> <td>54</td> <td>52</td> </tr> </tbody> </table>						No. appeared on the die	1	2	3	4	5	6	Frequency	40	32	28	58	54	52				
No. appeared on the die	1	2	3	4	5	6																	
Frequency	40	32	28	58	54	52																	
Show that the die is biased.																							
15. a)	An experiment gave the following values. Find the least square fit of $v = at^b$.	4	3	5	1,12																		
<table border="1"> <tbody> <tr> <td>$v(\text{ft/min})$</td> <td>350</td> <td>400</td> <td>500</td> <td>600</td> </tr> <tr> <td>$t(\text{min})$</td> <td>61</td> <td>26</td> <td>7</td> <td>26</td> </tr> </tbody> </table>						$v(\text{ft/min})$	350	400	500	600	$t(\text{min})$	61	26	7	26								
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b)	Calculate the correlation coefficient for the following heights (inches) of fathers (X) and their sons (Y)	4	3	5	1,12																		
<table border="1"> <tbody> <tr> <td>X</td> <td>65</td> <td>66</td> <td>67</td> <td>67</td> <td>68</td> <td>69</td> <td>70</td> <td>72</td> </tr> <tr> <td>Y</td> <td>67</td> <td>68</td> <td>65</td> <td>68</td> <td>72</td> <td>72</td> <td>69</td> <td>71</td> </tr> </tbody> </table>						X	65	66	67	67	68	69	70	72	Y	67	68	65	68	72	72	69	71
X	65	66	67	67	68	69	70	72															
Y	67	68	65	68	72	72	69	71															
16. a)	Using Half-range sine series for $f(x) = 1$ in $0 < x < \pi$, Show that $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \dots$	4	3	1	1,12																		
b)	Find the Fourier Cosine transform of e^{-ax} and hence evaluate $\int_0^{\infty} \frac{\cos \lambda x}{x^2 + a^2} dx$.	4	3	2	1,12																		
17.	Answer any two of the following:																						
a)	The marks obtained in statistics in a certain examination found to be normally distributed. If 15 % of the students ≥ 60 marks, 40% < 30 marks. Find the mean and Standard deviation.	4	3	3	1,12																		
b)	If two independent random samples of sizes $n_1 = 13, n_2 = 7$ are taken from a normal population. Estimate the level of significance that the variance of the first sample will be at least four times as large as that of the second sample.	4	3	4	1,12																		
c)	Prove that $ \nu \leq 1$, where ν is coefficient of correlation.	4	2	5	1,12																		

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

i)	Blooms Taxonomy Level - 1	22%
ii)	Blooms Taxonomy Level - 2	35%
iii)	Blooms Taxonomy Level - 3 & 4	43%
