Hall Ticket Number:

Code No. : 13233

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD
(Accredited by NAAC with A++ Grade)
B.E. (C.S.E. : CBCS) III-Semester Main Examinations, February-2021
Transform Techniques, Probability and Statistics

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.	Determine a_1 in the Fourier series for $f(x)=|x|,-\pi<x<\pi$.	2	1	1	1,2
2.	Find the sum of the Fourier series of $f(x)=\begin{cases}\pi, & -2<x<0 \\ 0, & 0\le x<2\end{cases}$ at $x=0$.	2	1	1	1,2
3.	Define Fourier transform and inverse Fourier transform.	2	1	2	1,2
4.	If $F\{f(x)\}=F(s)$, then show that $F\{f(x-a)\}=e^{isa}F(s)$.	2	2	2	1,2
5.	A random variable X has the following probability distribution: <table><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>3k</td><td>3k</td><td>k</td><td>2k</td><td>6k</td></tr></table> Find the value of k.	2	1	3	1, 12
6.	If the distribution function of a random variable X is $F(x)=\begin{cases}(1+x)e^{-x}, & x\ge 0 \\ 0 & ,x<0\end{cases}$, then find the probability density function of X.	2	2	3	1,2
7.	Define null hypothesis and alternative hypothesis.	2	1	4	1, 12
8.	Write about level of significance in hypothesis testing.	2	2	4	1, 12
9.	Derive the normal equations for fitting a straight line.	2	3	5	1, 12
10.	Show that the arithmetic mean of the regression coefficients is greater than the correlation coefficient.	2	2	5	1, 12
11.	State Dirichlet's conditions for Fourier series expansion.	2	1	1	1,2
12.	Find the Fourier cosine transform of $f(x)=\begin{cases}1 & 0<x<2 \\ 0, & x\ge 2\end{cases}$.	2	1	2	1,2

Part-B (3 × 14 = 42 Marks)

		M	L	CO	PO
13. a)	Obtain the Fourier series to represent $f(x)=\left(\dfrac{\pi-x}{2}\right)^2,0<x<2\pi$.	8	2	1	1,2
b)	Expand $f(x)=|\cos x|$ as a Fourier series in the interval $(-\pi,\pi)$.	6	2	1	1,2
14. a)	Find the Fourier transform of $f(x)=\begin{cases}1, & |x|<1 \\ 0, & |x|>1\end{cases}$ and hence evaluate $\displaystyle\int_{-\infty}^{\infty}\dfrac{\sin x}{x}dx$.	8	3	2	1,2
b)	If the Fourier sine transform of $f(x)$ is $\dfrac{e^{-as}}{s}$, then find $f(x)$.	6	3	2	1,2

			M	L	CO	PO
15.	a)	A continuous random variable X has the probability density function $f(x) = \begin{cases} k(1-x^2), & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$. Find (i) k (ii) E(X) (iii) Var(X) (iv) $P\left(X < \dfrac{1}{2}\right)$ and (v) distribution function of X.	10	2	3	1, 12
	b)	If X is a random variable, then prove that Var(kX+c) = k² Var(X), where k and c are constants.	4	2	3	1, 12
16.	a)	A random blood sample for test of fasting sugar for 10 boys gave the following data (in ms/dl) : 70,120,110,101,88,83,95,107,100,98 Does this data support the assumption of population mean of 100 mg/dl ? Test at 5% level of significance.	7	4	4	1, 12
	b)	Two samples are drawn from two normal populations. From the following data, test whether the two samples have the same variances at 5% level of significance. Sample I : 60 65 71 74 76 82 85 87 – – Sample II : 64 66 67 85 78 88 86 85 63 91	7	4	4	1, 12
17.	a)	Calculate the correlation coefficient from the following data :	7	1	5	1, 12

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

			M	L	CO	PO
	b)	Using the method of least squares, fit a straight line of the form $y = a + bx$ to the following data:	7	3	5	1, 12

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

			M	L	CO	PO
18.	a)	Find the half range cosine series for $f(x) = (x-1)^2$ in (0,1) and hence show that $\dfrac{1}{1^2} + \dfrac{1}{3^2} + \dfrac{1}{5^2} + \ldots = \dfrac{\pi^2}{8}$.	7	3	1	1,2
	b)	Obtain the Fourier sine transform of $e^{-|x|}$. Hence show that $\displaystyle\int_0^\infty \dfrac{x \sin kx}{1+k^2}\, dx = \dfrac{\pi e^{-k}}{2}, k > 0$.	7	3	2	1,2
19.		Answer any *two* of the following:				
	a)	In a distribution which is exactly normal, 12% of the items are under 30 and 85% are under 60. Find the mean and standard deviation of the distribution.	7	4	3	1, 12
	b)	Fit a Poisson distribution to the following data and test for goodness of fit at 5% level of significance.	7	4	4	1, 12

x:	0	1	2	3	4	5
f:	110	170	130	60	23	7

			M	L	CO	PO
	c)	The two lines of regression are $x = -0.4y + 6.4$ and $y = -0.6x + 4.6$. Find the mean values of x, y and the coefficient of correlation between x and y.	7	3	5	1, 12

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

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	60
2	Knowledge on application and analysis (Level-3 & 4)	40
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	0

*****