Hall Ticket Number:

Code No. : 13163 N/O

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. III-Semester Main & Backlog Examinations, Jan./Feb.-2024

Transform Techniques & Partial Differential Equations

(Common to Civil , EEE & Mech.)

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

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.	Write the sufficient conditions for the existence of Laplace transform of a function.	2	1	1	1,2,12
2.	Find $L\left\{\frac{\sin t}{t}\right\}$.	2	2	1	1,2,12
3.	Find $L^{-1}\left\{\frac{s}{s^2+4s+5}\right\}$.	2	2	2	1,2,12
4.	If $L^{-1}\{F(s)\}=f(t)$, then show that $L^{-1}\{F(as)\}=\frac{1}{a}f\left(\frac{t}{a}\right), a>0$.	2	1	2	1,2,12
5.	Write Dirichlet's conditions for existence of a Fourier series.	2	1	3	1,2,12
6.	Determine the Fourier coefficient a_0 in the Fourier series expansion of $f(x)=x^2\sin x, \quad [0,2\pi]$.	2	2	3	1,2,12
7.	Form a partial differential equation from $2z=(ax+y)^2+b$ by eliminating arbitrary constants *a* and *b*.	2	1	4	1,2,12
8.	Solve $xp+yq=z$.	2	2	4	1,2,12
9.	Write the Laplace's equation in two dimensions	2	1	5	1,2,12
10.	Write one dimensional wave and heat equations.	2	1	5	1,2,12
	Part-B (5 × 8 = 40 Marks)				
11. a)	State and prove the first shifting theorem.	4	1	1	1,2,12
b)	Evaluate $\int_0^\infty e^{-2t}\, t \sin t\, dt$ using Laplace transforms.	4	3	1	1,2,12
12. a)	Find $L^{-1}\left\{\frac{(s-4)e^{-\pi s}}{s^2-16}\right\}$.	4	3	2	1,2,12
b)	Solve $y''+y=\sin 3t, y(0)=y'(0)=0$ using Laplace transforms.	4	3	2	1,2,12
13.	Find the Fourier series expansion for $f(x)=x^2$ in $[-\pi,\pi]$ and hence derive the values of (i) $\sum_{n=1}^{\infty}\frac{1}{n^2}$ (ii) $\sum_{n=1}^{\infty}\frac{(-1)^{n-1}}{n^2}$ and (iii) $1+\frac{1}{3^2}+\frac{1}{5^2}+\ldots$.	8	3	3	1,2,12

Contd... 2

14. a)	Solve $(y+z)p-(x+z)q=x-y$.	4	2	4	1,2,12
b)	Solve $p(1+q^2)=q(z-1)$.	4	2	4	1,2,12
15.	A string of length l fixed at both ends is initially at rest in equilibrium position and each of its points is given the velocity $\left(\frac{\partial u}{\partial t}\right)_{t=0}=a\sin^3\left(\frac{\pi x}{l}\right)$. Find the displacement $u(x,t)$.	8	4	5	1,2,12
16. a)	Find $L\left\{\frac{e^{-2t}-e^{-4t}}{t}\right\}$.	4	2	1	1,2,12
b)	Apply convolution theorem to find $L^{-1}\left\{\frac{1}{(s-1)(s-2)}\right\}$.	4	3	2	1,2,12
17.	Answer any ***two*** of the following:				
a)	Express $f(x)=2x-1$ as a half range sine series in $[0,1]$.	4	3	3	1,2,12
b)	Eliminate the arbitrary function f to obtain a partial differential equation from $f(x+y+z,x^2+y^2+z^2)=0$.	4	2	4	1,2,12
c)	Find the solution of $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ satisfying $u(0,t)=u(2,t)=0$ and $u(x,0)=x$.	4	3	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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