

Name:	Printed Pages:
Student University Roll No.:	
<p align="center">School of Engineering Second Sessional Examination, Odd Semester (AS: 2023-24) B. Tech Year: 2nd Semester: III</p>	
Course Title: Complex Analysis and Integral Transforms	Max Marks: 60 Time: 3hrs
Course Code: BAS3301	

Instructions if any: Read the question Carefully.

SECTION 'A'		CO	Marks
Q.N.1. Attempt all parts of the following:			
a)	Define analytic function.	CO3	1
b)	Find the integral $\int_C \frac{3z^2+7z+1}{z+1} dz$, where C is the circle $ z = \frac{1}{2}$.	CO5	1
c)	Define isolated singularity of the function.	CO5	1
d)	Determine the poles of the function $f(z) = \frac{z^2}{(z+2)(z-1)^2}$.	CO7	1
e)	Find the Laplace transform of $t \sin t$	CO8	1
f)	Find the Inverse Laplace inverse transform of $\frac{1}{s^{1/2}}$	CO8	1
g)	State Fourier Integral Theorem.	CO9	1
h)	Find the Z -transform of the sequence $\{a^k\}; k \geq 0$.	CO10	1
SECTION 'B'		CO	Marks
Q.N.2. Attempt any two parts of the following:			
a)	Prove that the function $z z $ is not analytic anywhere.	CO3	6
b)	Evaluate $\int_0^{2\pi} \frac{\cos \theta}{3 + \sin \theta} d\theta$	CO5	6
c)	Using Laplace transform, find the solution of the initial value problem $x'' + 9x = \cos 2t$; if $x(0) = 1, x(\pi/2) = -1$.	CO8	6
d)	Find the Fourier Sine integral for $f(x) = e^{-\beta x}$ hence show that $\frac{\pi}{2} e^{-\beta x} = \int_0^{\infty} \frac{\lambda \sin \lambda x}{\beta^2 + \lambda^2} d\lambda$	CO9	6
SECTION 'C'		CO	Marks

Q.N.3. Attempt any two parts of the following:

a)	Define analytic function. Find analytic function $f(z)$, given that $v = e^x(x \sin y + y \cos y)$.	CO3	5
b)	Let $f(z) = u(x, y) + iv(x, y)$ be an analytic function. If $u = 3x - 2xy$, then find harmonic conjugate function.	CO3	5
c)	Evaluate $\int_C \frac{e^z}{(z-1)(z-4)} dz$ where C is the circle $ z = 2$ by using Cauchy's Integral formula.	CO6	5

Q.N.4. Attempt any two parts of the following:

a)	Find the Taylor series expansion of a function of the complex variable $f(z) = \frac{1}{(z-1)(z-3)}$ about the point $z = 4$.	CO7	5
b)	Expand $f(z) = \frac{1}{(z^2 + 1)(z + 2)}$ in Laurent series valid for (i) $1 < z < 2$ (ii) $ z > 2$	CO7	5
c)	Evaluate by using Residue theorem $\int_C \frac{12z - 7}{(z - 1)^2(z + 3)} dz$ where C is the circle $ z = 2$. $ z + i = 2$. $ z + i = \sqrt{3}$	CO7	5

Q.N.5. Attempt any two parts of the following:

a)	Obtain the Laplace transform of $t^2 e^{2t} \sin 2t$.	CO8	5
b)	find $L^{-1} \left\{ \frac{1}{(s+2)^2(s-2)} \right\}$.	CO8	5
c)	Use Laplace transform to solve $\frac{dx}{dt} - y = e^t$; $\frac{dy}{dt} + x = \sin t$ given that $x = 1$, $y = 0$ at $t = 0$.	CO8	5

Q.N.6. Attempt any two parts of the following:

a)	Find the Fourier cosine transform of $f(x) = 5e^{-2x} + 2e^{-5x}$	CO9	5
b)	Find the Fourier Sine transform of $\frac{e^{-ax}}{x}$	CO9	5
c)	Find the inverse Z - transform of $\left\{ \left(\frac{1}{3} \right)^{k+1} \right\}$	CO10	5