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

Instructions if any: Read the question Carefully.

	SECTION 'A' Q.N.1. Attempt all parts of the following:	CO	Marks
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 $\lvert z\rvert = \frac{1}{2}$.	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 $t\,sint$	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 $z\lvert z\rvert$ 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 $x'' + 9x = cos2t$; 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 $\lvert z\rvert = 2$ 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) $1 < \lvert z\rvert < 2$ (ii) $\lvert z\rvert > 2$	CO7	5
c)	Evaluate by using Residue theorem $\int_C \frac{12z-7}{(z-1)^2(2z+3)} dz$ where C is the circle $\lvert z\rvert = 2$. $\lvert z+i\rvert = 2$. $\lvert z+i\rvert = \sqrt{3}$	CO7	5
	Q.N.5. Attempt any two parts of the following:		
a)	Obtain the Laplace transform of $t^2 e^{2t} sin2t$.	CO8	5
b)	find $L^{-1}\left\{\frac{1}{(s+2)^2(s-2)}\right\}$.	CO8	5
c)	Use Laplace transform to solve $\frac{dx}{dt} - y = e^t$; $\frac{dy}{dt} + x = sint$ 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 $\left\{\left(\frac{1}{3}\right)^{\lvert k\rvert}\right\}$	CO10	5