

	<b>DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE</b> <b>Supplementary Examination – Summer 2023</b> <b>Course: B. Tech. (Common to all Branches) Semester : III</b> <b>Subject Name &amp; Code: Engineering Mathematics – III (BTBSC 301)</b> <b>Max Marks: 60 Date:08/08/2023 Duration: 3 Hrs.</b>	
	<b>Instructions to the Students:</b> 1. Attempt any <b>FIVE</b> of the following questions. 2. All questions carry equal marks. 3. Use of non-programmable scientific calculators is allowed. 4. Assume suitable data wherever necessary and mention it clearly.	
		Marks
<b>Q. 1</b>	<b>Solve Any Two of the following.</b>	<b>12</b>
A)	Find the Laplace transform of $F(t) = \frac{e^{-at} - e^{-bt}}{t}$	<b>6</b>
B)	Find the Laplace transform of $F(t) = \sin 2t \cos 3t$	<b>6</b>
C)	Find the Laplace transform of $\operatorname{erf}(\sqrt{t})$ .	<b>6</b>
<b>Q.2</b>	<b>Solve Any Two of the following:</b>	<b>12</b>
A)	State and prove the convolution theorem for finding the inverse Laplace transform.	<b>6</b>
B)	Using Partial Fraction method, find the inverse Laplace transform of $\bar{f}(s) = \frac{5s+3}{(s-1)(s^2+2s+5)}$	<b>6</b>
C)	Find the inverse Laplace transform of $\bar{f}(s) = \cot^{-1}\left(\frac{s+3}{2}\right)$	<b>6</b>
<b>Q. 3</b>	<b>Solve any Two of the following:</b>	<b>12</b>
A)	Find the Fourier sine transform of $e^{- x }$ , and hence show that $\int_0^\infty \frac{x \sin mx}{1+x^2} dx = \frac{\pi e^{-m}}{2}$ , $m > 0$	<b>6</b>
B)	Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2, &  x  \leq 1 \\ 0, &  x  > 1 \end{cases}$ . Hence evaluate $\int_0^\infty \left( \frac{x \cos x - \sin x}{x^3} \right) \cos \frac{x}{2} dx$ .	<b>6</b>
C)	Evaluate the integral $\int_0^\infty \frac{t^2}{(t^2+1)^2} dt = \frac{\pi}{4}$ .	<b>6</b>
<b>Q.4</b>	<b>Solve any Two of the following:</b>	<b>12</b>
A)	The partial differential equation by eliminating the arbitrary function from $z = x + y + f(xy)$	<b>6</b>
B)	The partial differential equations by eliminating the arbitrary constant $z = (x^2 + a)(y^2 + b)$	<b>6</b>
C)	Solve the following partial differential equations $(mz - ny)p + (nx + lz)q = ly - mx$ where the symbols have got their usual meanings.	<b>6</b>
<b>Q. 5</b>	<b>Solve any Two of the following:</b>	<b>12</b>
A)	Show that $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ is a harmonic function and hence determine the corre-	<b>6</b>

	sponding analytic function	
<b>B)</b>	If $f(z)$ is an analytic function with constant modulus, show that $f(z)$ is constant	<b>6</b>
<b>C)</b>	Under the transformation $W = \frac{1}{z}$ , find the image of $ z - 2i  = 2$ .	<b>6</b>
<b>Q. 6</b>	<b>Solve any Two of the following:</b>	
<b>A)</b>	Evaluate $\int_0^{1+i} (x^2 + iy) dz$ along the path $y = x$ and $y = x^2$	<b>6</b>
<b>B)</b>	Evaluate $\oint_C \frac{e^{-z}}{z+1} dz$ where $C$ is the circle $ z  = 2$ and $ z  = \frac{1}{2}$	<b>6</b>
<b>C)</b>	Use Cauchy's integral formula to evaluate $\oint_C \frac{e^{2z}}{(z+1)^4} dz$ , where $C$ the circle is $ z  = 2$ .	<b>6</b>
	<b>*** End ***</b>	