

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

**Supplementary Summer Examination – 2023**

**Branch : B. Tech ( Common to all)**

**Semester : III**

**Subject with code: Engineering Mathematics – III (BTBS 301)**

**Max Marks: 60**

**Date: 08/08/2023**

**Duration: 3 Hr**

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**Instructions to the Students:**

1. All the questions are compulsory.
  2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.
  3. Use of non-programmable scientific calculators is allowed.
  4. Assume suitable data wherever necessary and mention it clearly.
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	Level/CO	Marks
<b>Q.1 Solve Any Two of the following.</b>		<b>12</b>
A) Find the Laplace transform of $f(t) = \frac{e^t - \cos t}{t}$	Understand/ (CO1)	6
B) Using Laplace transform prove That $\int_0^\infty t e^{-3t} \sin t dt = \frac{3}{50}$	Understand/ (CO1)	6
C) Find the Laplace transform of the triangular wave function of period $2c$ given by $f(t) = \begin{cases} t, & 0 \leq t \leq c \\ 2c - t, & c < t < 2c \end{cases}$	Remember/ (CO1)	6
<b>Q.2 Solve Any Two of the following.</b>		<b>12</b>
A) Find the inverse Laplace transforms of $\bar{f}(s) = \frac{s e^{-4s}}{s^2 + 9}$	Understand/ (CO2)	6
B) By convolution theorem, find the inverse Laplace Transforms of $\bar{f}(s) = \frac{1}{s(s^2 - a^2)}$	Understand/ (CO2)	6
C) Solve the equation $\frac{d^3 y}{dt^3} + 2 \frac{d^2 y}{dt^2} - \frac{dy}{dt} - 2y = 0$ , where $y = 1, \frac{dy}{dt} = 2, \frac{d^2 y}{dt^2} = 2$ at $t = 0$ , by Laplace transform method.	Remember/ (CO2)	6
<b>Q.3 Solve Any Two of the following.</b>		<b>12</b>
A) Using the Fourier integral representations, show that $\int_0^\infty \frac{\cos x \omega}{1 + \omega^2} d\omega = \frac{\pi}{2} e^{-x} \quad (x \geq 0)$	Understand/ (CO3)	6
B) Find the Fourier sine transform of $\frac{e^{-ax}}{x}$ .	Understand/ (CO3)	6
C) Using Parseval's identity Evaluate $\int_0^\infty \frac{\sin^2 x}{x^2} dx$	Remember/ (CO3)	6

<b>Q.4</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	Form the partial differential equation by eliminating the arbitrary functions from $z = f(x + it) + g(x - it)$	Understand/ (CO4)	6
B)	Solve the partial differential equation $x(y^2 + z)p - y(x^2 + z)q = z(x^2 - y^2)$	Understand/ (CO4)	6
C)	Use the method of separation of variables to solve the equation $\frac{\partial^2 u}{\partial x^2} - 2 \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 0.$	Remember/ (CO4)	6
<b>Q.5</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	Find a function $w = u + iv$ which is analytic if $u = x^2 - y^2$ .	Understand/ (CO5)	6
B)	Evaluate $\int_C \frac{\cos \pi z^2}{(z-1)(z-2)} dz$ , where $C$ is $ z  = \frac{3}{2}$ .	Understand/ (CO5)	6
C)	By Residue theorem evaluate $\int_C \frac{dz}{(z^2+4)^2}$ , where $C$ is the circle $ z - i  = 2.$	Understand/ (CO5)	6

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