DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE.

Winter Examination – 2022

Course: - B. Tech. **Branch:** - Common for All branches **Semester:-** III

Subject Code & Name: BTBS301 **Engineering Mathematics-III**

Max. Marks: - 60 **Date:** - 09/03/2023 **Duration:** - 3-Hrs

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.*

		(Level/CO)	Marks
Q. 1	**Solve Any Three of the following.**		**12**
A)	Find Laplace Transform of $e^{-3t}\sin^2 t$	L3/CO1	**4**
B)	Find Laplace Transform of $f(t) = \begin{cases} 1 & 0 < t < 1 \\ 0 & 1 < t < 2 \end{cases}$ where f(t) is periodic function of period 2.	L3/CO1	**4**
C)	Evaluate using Laplace Transform.: $\int_0^\infty \frac{\cos 4t - \cos 3t}{t} dt$	L3/CO1	**4**
D)	Find Laplace Transform of $(1 + 2t - 3t^2 + 4t^3)H(t-2)$	L3/CO1	**4**

Q2	**Solve Any Three of the following.**		**12**
A)	Find the inverse Laplace transformation of the function. $\log\left(1 + \frac{a^2}{s^2}\right)$	L3/CO2	4
B)	By using convolution theorem find $L^{-1}\left[\frac{s}{(s^2+4)(s^2+9)}\right]$	L3/CO2	4
C)	Find the inverse Laplace transformation of the function. $\frac{5s^2-15s-11}{(s+1)(s-2)^2}$	L3/CO2	4
D)	Solve using Laplace transformation $y'' + 3y' + 2y = t\delta(t-1)\ for\ which\ y(0) = y'(0) = 0$	L3/CO2	4

Q.3 Solve Any Three of the following. (12)

A) Using Parseval's identity prove that $\int_0^\infty \frac{x^2}{(x^2+1)^2}dx = \frac{\pi}{4}$ L3/CO3 4

B) Find the Fourier transform of

$$f(x) = \begin{cases} 1 - x^2, & |x| \le 1 \\ 0 , & |x| > 1 \end{cases}$$

L3/CO3 4

C) Find the Fourier Sine transform e^{-ax}, $a > 0$ L3/CO3 4

D) Find the Fourier cosine transform of the function $f(y) = \begin{cases} cosy, & 0 < y < a \\ 0, & y > a \end{cases}$ L3/CO3 4

Q.4 Solve Any Three of the following. (12)

A) Form the partial differential equation by eliminating arbitrary constants from L3/CO4 4

$$(x - a)^2 + (y - b)^2 = z^2 \cot^2 \alpha$$

B) Solve the Partial differential equation $x(y - z)p + y(z - x)q = z(x - y)$ L3/CO4 4

C) Use the method of separation of variables to solve

$\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ given that $u(x, 0) = 6e^{-3x}$

L3/CO4 4

D) A bar with insulated at its ends is initially at temperature 0°C throughout. The end $x = 0$ is kept at 0 °C for all times and the heat is suddenly applied so that $\frac{\partial u}{\partial x} = 10\ at\ x = t$ for all time. Find the temperature function $u(x, t)$

L3/CO4 4

Q.5 Solve Any Three of the following. (12)

A) Determine k such that the function $f(z) = e^x \cos y + ie^x \sin ky$ is analytic. L3/CO5 4

B) Show that $u = x^2 - y^2 - 2xy - 2x + 3y$ is a harmonic function and L3/CO5 4

hence determine the analytic function $f(z)$ in terms of z.

C) Determine the pole of the function $f(z) = \frac{2Z-1}{Z(Z+1)(Z-3)}$ and also find the residue at each pole

& sum of all residues.

L3/CO5 4

D) Evaluate L3/CO5 4

$\oint_C \frac{\sin \pi z^2 + 2z}{(z-1)^2(z-2)}dz$, Where C is the circle $|z| = 4$

*** End ***