DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE		
Supplementary Examination – Supplementary Summer 2023		
Course: B. Tech. Branch :All Branches Semester :III		
Subject Code & Name: BTES301 Engineering Mathematics-III		
Max Marks: 60 Date:08/08/2023 Duration: 3 Hr.		

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)	$Find \;\; L\{e^{-t}tsin2tcohs2t\}$	**Understand**	**4**
B)	$Find \;\; L\left\{e^{-2t}\int_0^t \frac{sin3t}{t} dt\right\}$	**Understand**	**4**
C)	$Evaluate \; using \; Laplace \; transform \;\; \int_0^\infty e^{-t}\left[\frac{cos5t - cost}{t}\right] dt$	**Application**	**4**
D)	$Express \; the \; following \; function \; in \; Heaviside's \; unit \; step \; function$ $and \; find \; it's \; Laplace \; transform$ $f(t) = \begin{cases} t - 1, & 1 < t < 2 \\ 3 - t, & 2 < t < 3 \\ 0, & t > 3 \end{cases}$	**Application**	**4**
Q.2	**Solve Any Three of the following.**		**12**
A)	$Find \;\; L^{-1}\left[\frac{s - 1}{s(s + 2)(s - 3)}\right]$	**Application**	**4**
B)	$Find \;\; L^{-1}\left[\frac{1}{(s + 4)(s^2 + 1)}\right] by \; convolution \; theorem$	**Application**	**4**
C)	$Find \;\; L^{-1}\left\{log\left[\frac{s^2 - 4}{(s - 2)^2}\right]^{1/5}\right\}$	**Application**	**4**
D)	$Solve \;\; y'' - 6y' + 9y = t^2 e^{3t} ,$ $where \;\; y(0) = 2, y'(0) = 6$	**Application**	**4**
Q. 3	**Solve Any Three of the following.**		**12**
A)	$Find \; the \; Fourier \; integral \; representation \; of \; the \; function$ $f(x) = \begin{cases} e^{ax}, & x \le 0 \\ e^{-ax}, & x \ge 0 \end{cases}$ $and \; show \; that$ $\int_0^\infty \frac{cos\lambda x}{a^2 + \lambda^2} d\lambda = \frac{\pi}{2a} e^{-ax}$	**Evaluation**	**4**
B)	$Find \; the \; Fourier \; cosine \; transform \; of \;\; f(x) = e^{-x} + e^{-2x} , x > 0$	**Evaluation**	**4**
C)	$Find \; the \; Fourier \; sine \; transform \; of \;\; f(x) = \begin{cases} x, & 0 \le x \le 1 \\ 2 - x, & 1 \le x \le 2 \\ 0, & x > 2 \end{cases}$		**4**

D)	Solve the integral equation $$\int_0^\infty f(x)\cos\omega x\,dx = \begin{cases} 1-\omega, & 0<\omega<1 \\ 0, & \omega>1 \end{cases}$$	**Evaluation**	**4**
Q.4	**Solve Any Three of the following.**		**12**
A)	Form the partial differential equation by eliminating the arbitrary function from $(x-h)^2 + (y-k)^2 + z^2 = a^2$, h & k being constants	**Understand**	**4**
B)	Solve the partial differential equation $$\frac{y-z}{yz}p + \frac{z-x}{zx}q = \frac{x-y}{xy}$$	**Application**	**4**
C)	Using the method of separation of variables, solve $\frac{\partial u}{\partial x} + u = \frac{\partial u}{\partial t}$, if $u = 4e^{-3x}$, when $t = 0$	**Application**	**4**
D)	Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ under the conditions $u(x,0) = 3\sin n\pi x$, $u(0,t) = 0$, $u(l,t) = 0$, where $0 < x < l$.	**Application**	**4**
Q. 5	**Solve Any Three of the following.**		**12**
A)	Prove that $v = e^x \cos y + x^3 - 3xy^2$ is harmonic function. Find its harmonic conjugate and corresponding analytic function.	**Understand**	**4**
B)	Find the analytic function whose imaginary part is $r^2\cos 2\theta - r\cos\theta + 2$	**Understand**	**4**
C)	Evaluate $\int_c \frac{z}{(z-1)(z-2)^2}\,dz$, if c is the circle $|z-2| = \frac{3}{2}$ by using Cauchy residue theorem.	**Evaluation**	**4**
D)	Evaluate $\int_c \frac{3z+4}{z(2z+1)}\,dz$, if c is the circle $|z| = 1$ by using Cauchy Integral theorem.	**Evaluation**	**4**
	*** End ***		

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