

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 $L\{e^{-t}t\sin 2t\cos 2t\}$	Understand	4
B)	Find $L\left\{e^{-2t}\int_0^t \frac{\sin 3t}{t} dt\right\}$	Understand	4
C)	Evaluate using Laplace transform $\int_0^\infty e^{-t} \left[\frac{\cos 5t - \cos t}{t}\right] dt$	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 $f(x) = \begin{cases} e^{ax}, & x \leq 0 \\ e^{-ax}, & x \geq 0 \end{cases}$ 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 $f(x) = \begin{cases} x, & 0 \leq x \leq 1 \\ 2-x, & 1 \leq x \leq 2 \\ 0, & x > 2 \end{cases}$		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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