

UNIT 2nd LAPLACE TRANSFORM (Revision Sheet)

Q1. Find the inverse Laplace transform of

$$\frac{s}{s^4 + 4a^4}$$

Q2. (a) Using L.T. Show that $\int_0^{\infty} \frac{\sin t}{t} dt = \frac{\pi}{2}$

(b) Using convolution, find the inverse of

$$\frac{s^2}{(s^2 + w^2)^2}$$

Q3. Find the inverse L.T. of $\frac{s^2 + 2s - 3}{s(s-3)(s+2)}$

Q4. Find the inverse L.T. of $\frac{s+4}{s(s-1)(s^2+4)}$

Q5. (a) Find the inverse L.T. of $\frac{s^2 + 2s - 3}{s(s-3)(s+2)}$

(b) Solve the simultaneous equation

$$(b^2 - 3)x - 4y = 0$$

$$x + (D^2 + 1)y = 0$$

for $t > 0$, give that

$$x = y = \frac{dy}{dt} = 0 \quad \text{and} \quad \frac{dx}{dt} = 2at \quad \text{when } t = 0$$

Q6. (a) Find the L.T. of $\frac{e^{-t} \sin t}{t}$

(b) Solve, using L.T. technique, the difference equation

$$\frac{d^2 y}{dx^2} - 3 \frac{dy}{dx} + 2y = 4x + e^{3x}$$

Where $y(0) = 1$

& $y'(0) = -1$

Q7. Find (i) $L^{-1} \left[\frac{s^3}{s^4 - a^4} \right]$ (ii) $L \left[\frac{s}{(s^2 + a^2)^2} \right]$

Q8. Find (i) $L[f(t)]$, where $f(t) = \begin{cases} 2 + t^2, & 0 < t < 2 \\ 6, & 2 \leq t < 3 \\ 2t - 5, & 3 \leq t < \infty \end{cases}$

(ii) $L^{-1} \left[\frac{3^{s+1}}{s^2(s^2 + 4)} e^{3s} \right]$

- Q9. (a) Solve $y'' - ty' + y = 1$
 $y(0) = 1$
 $y'(0) = 2$ using L.T.
- (b) Solve, $y'' + y' - 2y = 2 \sin t \cos t$, if $0 < t < 2\pi$
 & $3 \sin^2 t - \cos 2t$, if $t > 2\pi$;
 $y(0) = 1, y'(0), y''(0) = 0$
- (c) Using convolution theorem, find the value of

$$L^{-1} \left\{ \frac{1}{s\sqrt{s+4}} \right\}$$

Q10 Evaluate $L^{-1} \left\{ \frac{e^{4-3s}}{(s+4)^{5/2}} \right\}$

Q11. Using L. T. show that

$$\int_0^1 \frac{\cos at - \cos bt}{t} dt = \frac{1}{2s} \log \left[\frac{s^2 + b^2}{s^2 + a^2} \right]$$

Q12. Find the L.T. of $f(t)$ defined as $f(t) = |t-1| + |t+1|, t \geq 0$

Q13. (a) Find the L.T. of the function

$$f(t) = \begin{cases} t, & 0 < t < c \\ (2c-t)', & c < t < 2c \end{cases}$$

(b) Show that $L \left[\int_0^t e^{-t} \frac{\sin t}{t} dt \right] = \frac{1}{s} \cot^{-1}(s-1)$

Q14. Find the Laplace transform of $f(t)$ defined as

$$f(t) = \begin{cases} t, & 0 < t < 4 \\ 5, & t > 4 \end{cases}$$

Q15. Find the laplace transform of

$$f(t) = \begin{cases} \sin wt & 0 < t < \frac{\pi}{w} \\ 0 & \frac{\pi}{w} < t < \frac{2\pi}{w} \end{cases}$$

Q16. Find the Laplace transform of $t^2 e^t \sin 4t$

Q17. Find $L \left(e^{-4t} \frac{\sin 3t}{t} \right)$

Q18. Find inverse Laplace transform of $\frac{s^2 + 3}{s(s^2 + a)}$

Q19. Find the inverse Laplace transform of $\frac{3s + 5\sqrt{2}}{s^2 + 8}$

Q20. Solve $\frac{d^2 y}{dx^2} + 2 \frac{dy}{dx} + 5y = e^{-x} \sin x$, where $y(0) = 0, y'(0) = 1$

Classes on (ED,BEEE,M1,M2,M3,NA,CONTROL,DSP & other GATE oriented Engineering Subjects)

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