Question Bank in Laplace Transforms

5 marks Questions

1. Find Laplace of $e^{2t} + 4t^3 - \sin 2t \cos 3t$
2. Find the Laplace Transform of $e^t \sin 2t \sin 3t$
3. Find the $L[e^{-t} \sin 2t \cos 3t]$
4. Find Laplace transform of $t\sqrt{1 + \sin t}$
5. Find Laplace of $\dfrac{\cos\sqrt{t}}{\sqrt{t}}$ given that $L[\sin\sqrt{t}] = \dfrac{\sqrt{\pi}}{2s^{3/2}} e^{-(1/4s)}$
6. Find the Laplace transform of $f(t) = te^{3t} \sin t$
7. Find Laplace transform of $f(t)$, where $f(t) = \begin{cases} t^2, & 0 < t < 1 \\ 1, & t > 1 \end{cases}$.

6 marks Questions

1. Find the Laplace Transform of $e^{-4t} \displaystyle\int_0^t u \sin 3u du$.
2. Find the Laplace Transform of $e^{3t} f(t)$ where $f(t) = \begin{cases} t - 1, & 1 < t < 2 \\ 3 - t, & 2 < t < 3 \\ 0, & \text{otherwise} \end{cases}$
3. Find Laplace Transform of $f(t)$ where $f(t) = \begin{cases} \cos t, & 0 < t < \pi \\ \sin t, & t > \pi \end{cases}$
4. Find Laplace Transform of $e^{-(1/2)} t f(3t)$ if $L[f(t)] = \dfrac{1}{s\sqrt{s+1}}$
5. Find Laplace Transform of $e^{-4t} \displaystyle\int_0^t u \sin u \; du$
6. Evaluate $\displaystyle\int_0^\infty e^{-2t} t \cos t dt$
7. By using Laplace transforms evaluate $\displaystyle\int_0^\infty \frac{\sin 2t + \sin 3t}{te^t} dt$
8. Find the Laplace Transform of $t(\dfrac{\sin t}{e^t})^2$
9. Find $L\left\{ t \left(\dfrac{\cos t}{e^t} \right)^2 \right\}$
10. Find the Laplace transform of $\cos^3 t \cos 5t$
11. Evaluate $\displaystyle\int_0^\infty e^{-2t} \; t \cos t \; dt$
12. Find the Laplace Transform of $e^{-4t} \displaystyle\int_0^t u \sin 3u du$

13. Prove that $\int_0^\infty e^{-t}\frac{\sin^2 t}{t}\,dt = \frac{1}{4}\log 5$

14. Using Laplace transform to evaluate $\int_0^\infty e^{-2t}\left(\int_0^t \frac{e^{-u}\sin u}{u}du\right)dt$

15. (i)If $L\{f(t)\} = \frac{1}{s^2+s+4}$, find $L\{e^{-2t}f(2t)\}$
    (ii) Find $L\{t^2\sin(at)\}$

16. Evaluate the following integral using Laplace Transform
    $I = \int_0^\infty e^{-t}\left(\int_0^t u\cos^2 u\ du\right)dt$

17. Find the Laplace Transform of $f(t) = \frac{\cos at - \cos bt}{t}$

8 marks Questions

1. Evaluate $\int_0^\infty e^{-2t}\cosh t\int_0^t u^2\sinh u\cosh u\ du\ dt$

2. Evaluate $\int_0^\infty e^{-2t}\left(\int_0^t \frac{e^{-u}\sin 2u}{u}du\right)dt$

3. Prove that $\int_0^\infty e^{-t}\frac{\sin 2t+\sin 3t}{t}\,dt = \frac{3\pi}{4}$

4. Evaluate the following integral by using Laplace transforms.
    $\int_0^\infty e^{-2t}\left(\int_0^t\left(\frac{e^{3u}\sin^2 2u}{u}\right)du\right)dt$