

Sample Question Paper Engineering Mathematics- 3

1. If $f(t) = \left(\sqrt{t} + \frac{1}{\sqrt{t}}\right)^2$, find $L[f(t)]$ and hence find $L\{e^{2t}f(t)\}$
2. Find $L^{-1}\left\{\frac{1}{s(s^2+4)}\right\}$
3. Obtain half-range cosine series for $f(x) = x(2-x)$ in $0 < x < 2$
4. Find moment generating function of the following distribution.
Hence find mean and variance.

X	1	3	4	5
$P(X)$	0.4	0	0.1	2

5. A Find the orthogonal trajectories of the family of curves $6e^{-x}[x\sin y - y\cos y] = c$
6. Find $L\left\{t\left(\frac{\cos t}{e^t}\right)^2\right\}$
7. Find the Fourier series expansion for $f(x) = 2, -2 < x < 0$.
Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$
8. A Find $L^{-1}\left\{\log\left(1 - \frac{1}{s^2}\right)\right\}$
9. Find the analytic function $f(z) = u + iv$ where $u + v = \frac{\sin 2x}{\cosh 2y - \cos 2x}$, using Milne-Thompson's Method.
10. Fit a parabola $x = a + by + cy^2$ for the following data:

$X: \hat{y}$	1	2	3	4	5
$Y: ^{\wedge}$	10	३	12	3	15

11. The first 4 moments of a distribution about origin of the random variable X are -1.5, 17, -30 and 108. Compute Mean, variance, μ_3 and μ_4 .
12. Consider the equations of regression lines $5x - y = 22$ and $64x - 45y = 24$. Find \bar{x}, \bar{y} and correlation coefficient.

13. Find $L^{-1} \left\{ \frac{(s+3)^2}{(s^2+6s+13)^2} \right\}$

14. Find the Laplace transform of $\cos^3 t \cos 5t$.

15. Find Spearman's rank correlation coefficient for the data below:

X:	32	55	49	60	43	37	43	49	10	20
Y:	40	30	70	20	30	50	72	60	45	25

16. Obtain Fourier Series for $f(x) = \frac{1}{2}(\pi - x)$ in $(0, 2\pi)$.
Hence, deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$

17. If $f(x)$ is probability density function of a continuous random variable X, find k, mean and variance.

$$f(x) = \begin{cases} kx^2, & 0 \leq x \leq 1 \\ (2-x)^2, & 1 \leq x \leq 2 \end{cases}$$

18. Check if there exists an analytic function whose real part is $u = \sin x + 3x^2 - y^2 + 5y + 4$. Justify your answer.

19. Evaluate the following integral by using Laplace transforms

$$\int_0^\infty e^{-2t} \left[\int_0^t \left(\frac{e^{3u} \sin^2 2u}{u} \right) du \right] dt$$