Sample Question Paper Engineering Mathematics-3

1. Find the Laplace transform of $\frac{\cos 2t \sin t}{e^t}$

2. Find k such that $f(z) = \frac{1}{2}\log(x^2 + y^2) + i\tan^{-1}\frac{kx}{y}$ is analytic

3. Calculate the Spearman's rank correlation coefficient R

   X : 10,12,18,18,15,40.
   Y : 12,18,25,25,50,25

4. Find the inverse Laplace transform of $\log\left(\frac{s^2+a^2}{s^2+b^2}\right)$

5. A continuous random variable has probability density function

$$f(x) = k(x - x^2), 0 \le x \le 1.$$

$$f(x) = 0 \text{ otherwise}$$

   Find k , mean and variance.

6. Find the Laplace transform of $e^{-3t}\int_0^t u\sin 3u\,du$.

   Hence show that $\frac{\pi^2}{12} = \frac{1}{1^2}, \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2}$

7. If the imaginary part of the analytic function $w = u + iv = f(z)$ is

$$V = x^2 - y^2 + \frac{x}{x^2 + y^2}, \text{ then show that } u = -2 \times y + \frac{y}{x^2 + y^2}.$$

8. Find inverse Laplace transform of $\frac{2s^2-6s+5}{(s^3-6s^2+11s-6)}$

9. Obtain the Fourier series to represent f(x) = x^3 in $(-\pi, \pi)$.

10. Find the orthogonal trajectories of the family of curves $x^3y - xy^3 = c$.

11. Obtain the half range cosine series of $f(x) = x$ in (0,2)

   Hence show that $\frac{\pi^4}{96} = \frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} \cdots \ldots \ldots$

12. Using convolution theorem Find the inverse Laplace transform of $\left[\frac{s^2}{(s^2+2^2)^2}\right]$

13. The probability density function of a random variable X is?

   Find $k, p(X < 5), P(X > 5)$

14. If $v = 3x^2 y + 6xy - y^3$, show that v is harmonic function And find the corresponding analytic function.