

SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY
DEEMED UNIVERSITY

Course: B.E./B.Tech.

Semester: III

Title of the paper: Engineering Mathematics III

Applied Mathematics

Max. Marks: 80

Sub. Code: 301/23303/ 24301 (2002/2003/2004)

Time: 3 Hours

PART – A

(10 x 2 = 20)

Answer ALL the Questions

1. State the sufficient conditions for the existence of the Laplace Transform.
2. Find $L\left[t^{\frac{3}{2}}\right]$.
3. Write $L[x'''(t)]$.
4. Solve the integral equation $\frac{dy}{dt} + 2y + \int_0^t y dt = 0, y(0) = 1$.
5. Define analytic function.
6. Find the bilinear transformation that Maps the points $z_1 = \infty, z_2 = i$ and $z_3 = 0$ into the points $\omega_1 = 0, \omega_2 = i$ and $\omega_3 = \infty$.
7. Define singularity of the function.
8. Expand $\sin z$ in a Taylor series about $z = 0$.
9. Define level of significance.
10. Give the Main use of chi-square test.

PART – B

(5 x 12 = 60)

Answer ALL the Questions

11. (a) Find $L[t^2 e^t \sin t]$

(b) Find $L^{-1} \left[\frac{s}{(s^2 + a^2)^2} \right]$.

(or)

12. (a) Find the laplace transform of the periodic function

$$f(t) = \begin{cases} t & , \quad 0 < t < b \\ 2b - t & , \quad b < t < 2b \end{cases}$$

(b) Find $L^{-1} \left[s \log \left(\frac{s-1}{s+1} \right) + 2 \right]$.

13. (a) Using Laplace transformation

$$y'' - 3y' + 2y = e^{2t}, \quad y(0) = -3 \text{ and } y'(0) = 5$$

(b) Solve the integral equation $F(t) = 5t + \int_0^t F(u) \sin(t-u) du$.

(or)

14. Solve: $\frac{dx}{dt} + \frac{dy}{dt} = t$, $\frac{dx^2}{dt^2} - y = e^{-t}$ given that $x = 0$, $y = 0$

$$\frac{dx}{dt} = 0 \text{ When } t = 0$$

15. (a) Derive the C – R equations in polar form.

(b) Find the image of $|z - 2i| = 2$ under the transformation $\omega = \frac{1}{z}$

(or)

16. (a) Show that the function $u = \frac{1}{2} \log (x^2 + y^2)$ is harmonic and determine its conjugate. Also find $f(z)$.
 (b) Find the bilinear transformation which Maps the points $z_1 = -1, z_2 = 0, z_3 = 1$ into the points $\omega_1 = 0, \omega_2 = i$ and $\omega_3 = 3i$ respectively.

17. (a) State and prove Cauchy's integral formula.

(b) Evaluate $\int_c \frac{z^2 - 2z}{(z + 1)^2 (z^2 + 4)} dz$ where c is the circle $|z| = 3$,

using residue theorem.

(or)

18. (a) Expand $f(z) = \frac{z^2 - 1}{(z + 2)(z + 3)}$ in a laurent's series

if (i) $|z| > 3$ (ii) $2 < |z| < 3$.

(b) Using contour integration, Evaluate $\int_0^{\infty} \frac{dx}{(x^2 + 1)^2}$

19. (a) The Mean Weekly sales of soap bars in departmental stores was 146.3 bars per store. After an advertising campaign the mean weekly sales in 22 stores for a typical weak increased to 153.7 and showed a S.D of 17.2. was the advertising campaign successful.

(b) Given the following contingency table for hair colour and eye colours. Find the value of ψ^2 . In their good association between two.

		Hair colour			
Eye colour		Fair	Brown	Black	Total
	Blue	15	5	20	40
	Grey	20	10	20	50
	Brown	25	15	20	60
	Total	60	30	60	150

(or)

20. (a) A group of 10 rats on diet X and another group of 8 rats fed on a different diet Y, recorded the following increase in weight in grams.

Diet X	5	6	8	1	12	4	3	9	6	10
Diet Y	2	3	6	8	1	10	2	8		

Find whether Variances differ significantly?

- (b) In a sample of 400 parts Manufactured by a factory, the number of defective parts was found to be 30. The company, however claimed that only 5% of their product is defective. Is the claim tenable?