SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act,1956)

Course & Branch: B.E./B. Tech – Common to ALL Branches – Except EEE & Bioinformatics
Title of the paper: Engineering Mathematics–III/Applied Mathematics
Semester: III Max. Marks: 80
Sub.Code: 301 (2002/ 2003/ 2004/2005) Time: 3 Hours
Date: 14-11-2006 Session: FN

PART – A (10 x 2 = 20)

Answer ALL the Questions

1. Find L(sin at cos at)

2. Find $L^{-1}\left(\frac{1}{s(s^2+9)}\right)$.

3. What are the advantages of solving differential equations by Laplace transform techniques?

4. Write down the CR equations in polar from for a function to be analytic.

5. Show that an analytic function with constant argument is constant.

6. Define a bilinear transformation.

7. Evaluate $\int_c (2z+1)\,dz$ where c is the circle $|z-1| = 2$

8. Find the residue of $\frac{z}{(z-1)(z-2)}$ at z = 1.

9. Given $n_1 = 400$, $\overline{x_1} = 250$, $s_1 = 40$ and $n_2 = 400$, $\overline{x_2} = 220$, $s_2 = 55$. Find the standard error of $\overline{x_1} - \overline{x_2}$.

10. Define student's t – test for the difference of means of two samples.

PART – B (5 x 12 = 60)

Answer ALL the Questions

11. (a) Find L $[e^{-t} t \cos^2 t]$

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

(or)

12. (a) Find $L\left(\frac{1 - e^t}{t}\right)$

(b) Using convolution theorem find $L^{-1}\left(\frac{2}{(s^2+1)(s^2+4)}\right)$

13. Solve the following differential equation using Laplace transforms $y'' + 4y' + 8y = \cos 2t$ given that $y(0) = 2$, $y'(0) = 1$.

(or)

14. Solve the integral equation $\frac{dy}{dt} + y + 3\int_0^t y\,dt = \cos t + 3\sin t$

given that $y(0) = 2$.

15. (a) Construct the analytic function whose real part is

$e^x(x \cos y - y \sin y)$

(b) Show that the transformation $\omega = \frac{1}{z}$ transforms all circles and straight lines in the z plane into circles or straight lines in the w-plane.

(or)

16. (a) If f(z) = u +iv is an analytic function, prove that

$$\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \; | f(z) |^2 = 4 | f'(z) |^2$$

(b) Find the bilinear transformation, mapping the points z = 1, i, –1 into ω = 2, i, –2 respectively.

17. (a) Using Cauchy's Integral formula, find the value of

$$\int_c \frac{z + 4}{z^2 + 2z + 5} \, dt$$

where C is the circle $| z + 1 - i | = 2$

(b) Find the Laurent expansion of the function

$$f(z) = \frac{7z - 2}{(z + 1)z(z - 2)}$$ in the annular $1 < | z+1| < 3$

(or)

18. (a) Evaluate $\int_c \frac{3z^2 + z + 1}{(z^2 - 1)(z + 3)} \, dz$, if c is the circle |z| = 2.

(b) Using contour integration, show that

$$\int_c^{\infty} \frac{x^2}{(x^4 + a^4)} \, dx = \frac{\pi}{2\sqrt{2}\, a}, \quad a > 0.$$

19. (a) A coin is thrown 500 times and 262 heads were observed. Can we conclude that the coin is a fair one.

(b) Two independent samples are chosen from two schools A and B and a common test is given in a subject. The scores of the students are as follows:

School A	76	68	70	43	94	68	33	
School B	40	48	92	85	70	76	68	22

Can we conclude that students of school A perform better than school B?

(or)

20. (a) On the basis of information given below for treating 200 cancer patients, state whether the new treatment is comparatively superior to the conventional treatment.

	Favorable	Not Favorable	Total
New	60	30	90
conventional	40	70	110

(b) From the following table conclude whether the eye colour and hair colour are associated or not.

Hair colour / Eye colour	Fair	Brown	Black
Grey	20	10	20
Brown	25	15	20
Black	15	5	20