SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E/B.Tech – Common to ALL Branches
(Except to Bio Informatics & 2005 B.E –EEE)
Title of the paper: Engineering Mathematics - III
Semester: III Max.Marks: 80
Sub.Code: 301-(2003-04-05)-6C0032-6C0049(06-07)
Time: 3 Hours
Date: 21-04-2009 Session: AN

PART – A (10 x 2 = 20)

Answer All the Questions

1. Obtain the Laplace transform of sin4tcos2t in the simplified form.

2. State and prove Initial value theorem.

3. Prove that $L\{f'(t)\} = s\,L\{f(t)\} - f(0)$.

4. Solve $y + \int_0^t y(u)du = e^{-1}$.

5. Show that w = log z is analytic.

6. Find the invariant point of the mapping $w = \frac{1}{z}$

7. State Cauchy's integral theorem.

8. Explain $f(z) = e^z$ in a Taylor's series about z = 0.

9. Define Type I and Type II errors.

10. A test was given to a large group of boys who scored on the average of 64.5 marks. The same test was given to a group of 400 boys who scored an average of 62.5 marks with a standard deviation 12.5 marks. Examine if the difference is significant.

PART – B (5 x 12 = 60)

Answer All the Questions

11. (a) Prove that the Laplace transform of the triangular wave of period 2π defined by

$$f(t)=\begin{cases} t, & 0 \le t \le \pi \\ 2\pi - t & \pi \le t \le 2\pi \end{cases}$$ is $\frac{1}{s^2}\tan h\left(\frac{\pi s}{2}\right)$.

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

(or)

12. (a) Find the Laplace Transform of (i) e^{-2t} tcost and

(ii) $\frac{\sin t}{t}$

(b) Verify initial and final theorem of $f(t) = 1+e^{-t}[\sin t+\cos t]$

13. Solve $(D^2+4)y = \sin 2t$, given $y = 3$, $Dy = 4$, when $t = 0$.

(or)

14. (a) Solve the simultaneous equation

$$\frac{dx}{dt} + y = \sin t; \frac{dy}{dt} + x = \cos t$$

given x(0) = 2, y(0) = 0. (8)

(b) Evaluate $\int_0^\infty \frac{e^{-t} - e^{-3t}}{t}\,dt$

(4)

15. (a) Show that the following function $u = e^x (x \cos y - y \sin y)$ is harmonic and hence find its corresponding analytic function.

(b) Find the bilinear transformation which maps $0, 1, \infty$ into i, -1, -i.

(or)

16. (a) If f(z) is a regular function of z, prove that

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

(b) Discuss the transformation $w = \frac{1}{z}$

17. (a) Using Cauchy's integral formula evaluate $\int_C \frac{e^z}{(z+1)^4}dz$ where C is the circle |z| = 2.

(b) Find Laurent's expansion of $f(z)=\frac{7z-2}{z(z-2)(z+1)}$ $in 1<|z+1|<3$

(or)

18. (a) Using residue theorem evaluate $\int \frac{zdz}{(z-1)^2(z+1)} where C is \quad |z| = \frac{1}{2}$

(b) Evaluate $\int_0^\infty \frac{dx}{x^4 + a^4}$ using Contour Integration.

19. (a) The means of two large samples of sizes 2000 and 1000 are 68.0 and 67.5gm respectively. Can the sample be regarded as drawn from the same population of standard deviation 2.25gm?

(b) The following is the distribution of hourly number or trucks arriving at a company's warehouse. Test for goodness of fit for poisson distribution at level of significance $\alpha = 0.05$

Trucks arriving per Hour	0	1	2	3	4	5	6	7	8
Frequency	52	151	130	102	45	12	5	1	2

(or)

20. (a) The following are the gains in weights (in gm) of rats fed on two different diets D_1 and D_2. Gains in weight are

Diet D_1	25	32	30	34	24	14	32	24	30	31	35	25			
Diet D_2	44	34	22	10	47	31	40	30	32	35	18	21	35	29	22

Find out whether they have come from the same population.

(b) On the basis of information noted below, find out whether the new treatment is comparatively superior to the conventional one.

	Favourable	Non – Favourable
Conventional	40	70
New	60	30