ANNA UNIVERSITY COIMBATORE

B.E. / B.TECH. DEGREE EXAMINATIONS : SEPTEMBER 2009

REGULATIONS – 2007

THIRD SEMESTER

070030004 - ENGINEERING MATHEMATICS III

(COMMON TO CIVIL / AERONAUTICAL / CSE / IT)

TIME: 3 Hours **Max. Marks: 100**

PART – A

(20 x 2 = 40 MARKS)

ANSWER ALL QUESTIONS

1. Form the Partial Differential Equation by eliminating the arbitrary constants from $z = ax+by+a^2+b^2$
2. Solve $p + q = 4$.
3. Solve $(D^2 - 6DD' + 9D'^2)z = 0$
4. Find the P.I. of $(D^2 - 4DD'^2)z = e^x$
5. State the Dirichlet's conditions for existence of Fourier Series for f(x).
6. Write the formulae for Fourier constants for f(x) in the interval $(-\pi, \pi)$.
7. Obtain the sine series for unity in $(0, \pi)$
8. If $f(x) = |x|$ expanded as a Fourier series in $-\pi < x < \pi$, Find a_0.
9. Explain the method of separation of variables
10. State the assumptions made in the derivation of one dimensional wave equation.
11. State one dimensional heat equation with the initial & boundary conditions.
12. When the ends of a rod length 20 cm are maintained at the temperature 10°C & 20°C respectively until steady state is prevailed. Determine the steady state temperature of the rod.

13. State the Fourier integral theorem
14. Find the Sine transform of e^{-x}.
15. State shifting theorem on Fourier Transform.
16. State convolution theorem for Fourier Transform.
17. Prove that $z(a^n) = z/z-a$
18. Find Z (sinat)
19. Find $Z^{-1}\left[\frac{z^2}{(z-a)^2}\right]$.
20. State the Final value theorem on Z transforms.

PART – B

(5 x 12 = 60 MARKS)

ANSWER ANY FIVE QUESTIONS

21. a) Form the Partial Differential Equation by eliminating the arbitrary functions f and g in $z = x^2f(y)+y^2g(x)$. 6

    b) Find the singular integral of $z = px + qy + 2\sqrt{pq}$. 6

22. a) Solve $p^2+q^2 = x^2 + y^2$ 6

    b) Solve $(D^3 - 4D^2D' + 4DD'^2)z = 6\sin(3x+6y)$ 6

23. Find the Fourier series of $f(x) = (\pi - x)^2$ in $(-\pi, \pi)$

24. a) Obtain the half range cosine series for $f(x) = x$ in (o, π) 6

    b) Find the complex form of the Fourier series $f(x) = \cos ax$ in $-\pi < x < \pi$, a is not an integer. 6

25. A string is stretched and fastened to two points ℓ apart. Motion is started displacing the string into the form of the curve $y = k(\ell x - x^2)$ and then released from rest in this position. Find the displacement $y(x,t)$.

26. Find the steady state temperature distribution in a square plate bounded by the lines $x=0$, $y = 0$, $x=20$, $y=20$. It's surfaces are insulated satisfying the boundary conditions $u(0,y) = u(20,y) = u(x,0) = 0$ and $u(x,20) = x(20-x)$.

27. a) Find the Fourier transform of $f(x) = \begin{cases} x, & |x| < a \\ 0, & |x| > a \end{cases}$ 6

b) Evaluate $\int_0^{\infty} \frac{dx}{(x^2+a^2)(x^2+b^{2)}}$ using transforms 6

28. Solve the difference equation using z transform method :

$y_{n+2} - 3y_{n+1} + 2y_n = n2^n$ given that $y(0) = 0$, $y(1) = 0$.

*****THE END*****