ANNA UNIVERSITY COIMBATORE

B.E. / B.TECH. DEGREE EXAMINATIONS : MAY / JUNE 2010

REGULATIONS : 2007

THIRD SEMESTER

070030004 - ENGINEERING MATHEMATICS III

(COMMON TO CSE / IT / CIVIL / AERONAUTICAL ENGG.)

TIME: 3 Hours Max. Marks :100

PART – A

(20 x 2 = 40 MARKS)

ANSWER ALL QUESTIONS

1. Form the PDE by eliminating the arbitrary constants 'a' and 'b' from $z=(x+a)(y+b)$.
2. Find the complete integral of the partial differential equation z = px+qy+p^2+q^2
3. Find the P.I of $(D^2+2DD'+D'^2)z=e^{x-y}$.
4. Form the PDE by eliminating the arbitrary function from $\phi\left(z^2-xy,\frac{x}{z}\right)=0$.
5. State the Parseval's formula for a function y = f(x) in the interval ($-\pi$, π).
6. Find the constant a_0 of the Fourier series for the function $f(x)=k,\ 0<x<2\pi$.
7. Find the R.M.S value of the function $f(x)=x\ in\ (0,l)$.
8. If f(x) is an odd function defined in (-1, 1) what are the values of a_0 and a_n.
9. Write down the suitable solution of one dimensional wave equation? Why?.
10. In the diffusion equation $\frac{\partial u}{\partial t}=\alpha^2\frac{\partial^2 u}{\partial x^2}$, what does α^2 stand for?
11. An insulated rod of length l = 60 cm has its ends at A and B maintained at $30^0\,C$ and $40^0\,C$ respectively. Find the steady state solution.
12. Write down the possible solutions of the Laplace equation.

13. State the modulation theorem.
14. Write the Fourier sine transform pair.
15. Find the Fourier cosine transform of e^{-ax}, $a>0$.
16. State Fourier Integral theorem.
17. Find $z^{-1}\left[\frac{z}{(z-1)(z-2)}\right]$, using partial fraction method.
18. Prove that $z(n)=\frac{z}{(z-1)^2}$
19. Solve $y_{n+1}-2y_n=0$ given $y_0=2$.
20. State the initial and final value theorem in z-transform.

PART – B

(5 x 12 = 60 MARKS)

ANSWER ANY FIVE QUESTIONS

21. a) Solve $(mz-ny)p+(nx-lz)q=ly-mx$ 6

b) Solve $\left(D^2+4DD'-5D'^2\right)z=3e^{2x-y}+\sin(x-2y)$ 6

22. a) Obtain the half range cosine series of $f(x)=(x-1)^2$ in $0\le x\le 1$. 6

b) Expand f (x) in a Fourier series upto 2nd harmonic using the following table 6

x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
y	1.0	1.4	1.9	1.7	1.5	1.2	1.0

23. A tightly stretched string with fixed end points x = 0 and $x = l$ initially in a position given by $y(x,0) = \sin^3 \frac{\pi x}{l}$ If it is released from rest from this position, find the displacement y at any time and at any distance from the end x = 0.

24. Find the Fourier Transforms for the function $f(x) = 1 - x^2, |x| \le 1$

$= 0 \quad , |x| > 1$

Hence evaluate (i) $\int_0^\infty \frac{\sin s - s\cos s}{s^3} \cos\frac{s}{2}\, ds$ (ii) $\int_0^\infty \frac{(x\cos x - \sin x)^2}{x^6}\, dx$

25. a) Solve the difference equation $y(n+2) - 3y(n+1) + 2y(n) = 2^n$, given that $y(0) = 0, y(1) = 0$ 6

b) Find the inverse Z – Transform of $\frac{8z^2}{(2z-1)(4z+1)}$ 6

26. A rod of length 20 cm has its ends A and B kept at $30^\circ c$ and $90^\circ c$ respectively until steady state conditions prevail. If the temperature at each end is then suddenly reduced to $0^\circ c$ and maintained so, find the temperature u (x, t) at a distance x from A at time 't'.

27. a) Solve z = px + qy + $p^2 - q^2$ 6

b) Obtain the Fourier series expansion of $f(x) = \begin{cases} 1, 0 < x < \pi \\ 2, \pi < x < 2\pi \end{cases}$. 6

28. a) Using Parseval's identity, evaluate $\int_0^\infty \frac{x^2}{(a^2 + x^2)} dx, a > 0$. 6

b) Find the inverse Z – Transform by using convolution theorem $\frac{z^2}{(z-a)^2}$. 6

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