ANNA UNIVERSITY COIMBATORE

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

REGULATIONS : 2008

THIRD SEMESTER

080100008 - TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

(COMMON TO AERONAUTICAL / AUTOMOBILE / BIOMEDICAL / CIVIL / CSE / IT / EEE / EIE / ECE / ICE / MECHANICAL / BIOTECH / CHEMICAL / FASHION TECH. / TEXTILE TECH. / TEXTILE CHEMISTRY)

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

PART – A

**(20 x 2 = 40 MARKS)**

ANSWER ALL QUESTIONS

1. Define the root-mean square value of a function f(x) in $(0,2\pi)$.
2. State the Dirichlet's conditions for Fourier series.
3. If the half range – cosine series of $f(x)=x(\pi-x)$ in $(0,\pi)$ is given by $x(\pi-x)=\pi^2/6-\sum_{n=1}^{\infty}(1/n^2)\cos 2nx$, find the value of $1/1^4 + 1/2^4 + \ldots\ldots\ldots\infty$
4. What do you mean by Harmonic analysis.
5. State Fourier Integral theorem.
6. Find the Fourier sine transform of $e^{-ax}$ (a>0).
7. State Parseval's identity for Fourier transform.
8. If $F\{f(x)\}=f(\bar{s})$ then $F\{f(x)\cos ax\}=$ ----------
9. Form the partial differential equation by eliminating the arbitrary function $z=f(x/y)$
10. Find the complete solution of the partial differential equation $\sqrt{p}+\sqrt{q}=1$
11. Find the particular integral of $(D^2+2DD'+D'^2)z=e^{x-y}$
12. Find the complete integral of the p.d.e. $z = px + qy + p^2 + q^2$

13. In the equation of motion of vibrating string $\frac{\partial^2 y}{\partial x^2} = c^2 \frac{\partial^2 y}{\partial t^2}$, what does $c^2$ stand for?

14. What are the laws assumed to derive the one dimensional heat equation?

15. Write all the solutions of Laplace's equation $\partial^2 u / \partial x^2 + \partial^2 u / \partial y^2 = 0$

16. If the ends of a string of length '$l$' are fixed and the mid point of the string is drawn aside through a height 'h' and the string is released from rest, state the initial and boundary conditions.

17. Prove that $Z[(-1)^n] = \frac{z}{z+1}$

18. Define convolution of two sequences {f(n) }and {g(n)}.

19. Find the inverse Z– transform of $\frac{z}{(z-1)(z-2)}$

20. State initial value theorem in Z - transform.

## PART – B

**(5 x 12 = 60 MARKS)**

**ANSWER ANY FIVE QUESTIONS**

21. (a) Find the Fourier Series of $f(x) = x + x^2$ in $(-\pi, \pi)$ of periodicity $2\pi$ 6

(b) Find the Fourier series expansion of period $2\pi$ for the function y = f(x) which is defined in $(0, 2\pi)$ by means of the table of values given below. Find the series upto the second harmonic. 6

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