SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act,1956)

Course & Branch: B.E. – EEE (For current III Semester only)
Title of the paper: Engineering Mathematics - III
Semester: III Max. Marks: 80
Sub.Code: 514301 Time: 3 Hours
Date: 14-11-2006 Session: FN

PART – A (10 x 2 = 20)

Answer ALL the Questions

1. Write the formula for finding Euler's constants of a Fourier series in $(0, 2\pi)$.
2. What is the value of a constant in one dimensional wave equation?
3. Write the boundary conditions for the following: A rod of length "L" cm has its ends A and B, kept at 0^{o}c. If initially its temperature is given by $u = cx(L - x)/L^2$. Find the temperature distribution in the rod.
4. Find $L[\cosh 2t + (2/\sqrt{\pi})]$
5. In the Fourier series expansion of $f(x) = |\cos x|$ in $(-\pi, \pi)$, what is the value of a_n?
6. By eliminating the arbitrary constants, form the partial differential equation from $(x-a)^2 + y^2 + (z - c)^2 = 1$.
7. Find the complementary function of the partial differential equation $(D^2 - 7DD' + 12D'^2)z = 0$.
8. State convolution theorem in Fourier Transform.
9. Solve $(D^2 - 4DD')z = 0$.
10. What is the inversion formula for Fourier cosine transform?

PART – B (5 x 12 = 60)

Answer ALL the Questions

11. (a) Find the Laplace transform of $f(t) = |\sin wt|$, $f(t+\pi/w) = f(t)$.

(b) Find $L^{-1}[s^2/((s^2+4)^2))]$,using convolution theorem.

(or)

12. (a) Solve $y'' - 4y' + 8y = e^{2t}$, $y(0) = 2$ and $y'(0) = -2$

(b) Find the Laplace transform of $f(t) = t^2e^{-3t}\cos 2t$

13. (a)Find the Fourier series of $f(x) = |\cos x|$ in $(-\pi, \pi)$

(b)Find the Fourier cosine series of $f(x) = x(\pi - x)$ in $(0, \pi)$ Hence find the sum of $\sum (1/n^4)$

(or)

14. (a) Find the complex form of Fourier series of $f(x) = e^{-ax}$ in $(-L,L)$

(b) Find the Fourier series of $f(x) = x^2 - x$ in $(-\pi, \pi)$. Hence find the sum of $\sum (1/n^4)$, assuming that $\sum (1/n^2) = \pi^2/6$

15. (a)Solve $(D^2 - 2DD' + D'^2)z = x^2y^2e^{x+y}$.

(b) Solve $px^{1/2} + qy^{1/2} = z^{1/2}$

(or)

16. (a) Solve $(D^2 + 4DD' - 5D'^2)z = xy + \text{Sin}(2x + 3y)$

(b) Solve $p\cot x + q\cot y = \cot z$

17. If a string of length 'L' is initially in the form $y = Lx - x^2$ at time t = 0. Motion is started by displacing the string from this Position. Find the displacement at any point x and at any subsequent time.

(or)

18. A square plate is bounded by the lines $x = 0$, $y = 0$, and $x = 20$, $y = 20$ and its faces are insulated. The temperature along the upper horizontal edge is given by $u(x, 20) = x(20 - x)$ for $0 < x < 20$, while the other three edges are maintained at 0^{o}c. Find the steady state temperature distribution in the plate.

19. (a) Find the Fourier Transform of

$$f(x) = \begin{cases} x, & |x|<a \\ 0, & |x|>a \end{cases}$$

(b) Find the Fourier Transform of $\exp(-a^2 x^2)$, $a > 0$. For what value of 'a', the given function is self reciprocal and hence show that $F(\exp(-x^2/2)) = \exp(-s^2/2)$.

(or)

20. (a) Find the Fourier sine transform of $f(x) = e^{-ax}$, $a>0$.

Hence deduce that $\int_0^{\infty} [\cos sx/(a^2 + s^2)]\, ds = (\pi/2a)e^{-ax}$

(b) Find the Fourier sine Transform of $f(x) = \dfrac{e^{-ax}}{x}$, $a > 0$