SATHYABAMA UNIVERSITY
(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E .B.Tech - CSE/IT/ECE/MECH/M&P/E&C/
EIE/CHEM/CIVIL/ETCE/AERO
Title of the paper: Engineering Mathematics - IV
Semester: IV Max. Marks: 80
Sub.Code: 401 (2002/2003/2004/2005) Time: 3 Hours
Date: 10-11-2007 Session: AN

PART – A (10 x 2 = 20)
Answer All the Questions

1. Write the formulas for Fourier constants for f(x) in the interval $(-\pi, \pi)$.

2. Find the constant a_0 of the Fourier series for the function $f(x) = x$ in $0 \le x \le 2\pi$.

3. Form the pde by eliminating f from $z = xf(y) + g(y)$.

4. Find the complete integral of $2p + 3q = 1$.

5. State the assumptions involved in deriving the heat flow equation.

6. Give the possible solution of the one-dimensional wave equation.

7. Write the solutions of Laplace equation in Polar coordinates.

8. Write the boundary conditions for the following problem:
A square plate has its faces and the edge $y = 0$ insulated. If the edges $x = 0$ and $x = \pi$ are kept at zero temperature and its fourth edge $y = \pi$ is kept at temperature f(x).

9. State Inversion Formula for a complex Fourier Transform.

10. Give the Fourier Cosine Transform of $f(x) = e^{-5x}$.

PART – B (5 x 12 = 60)
Answer All the Questions

11. Find the half range Fourier Cosine series and Sine series for $f(x) = x$ in $0 < x < \pi$.

(or)

12. Expand f(x) = x – x^2 as a Fourier series in -1 < x < 1 and using this series find the RMS value of f(x) in the interval.

13. (a) Solve (y – z)p + (x – y)q = z – x.

    (b) Find the singular integral of $\frac{z}{pq} = \frac{x}{q} + \frac{y}{q} + \sqrt{(pq)}$

(or)

14. (a) Solve:$P^2 + q^2 = z^2 (x^2 + y^2)$.

    (b) Solve zp + yp = x.

15. A tightly stretched string with fixed end points x = 0 and x = 1 is initially at rest in its equilibrium position. If it is set vibrating, giving each point a velocity 3x(1 – x), find the displacement.

(or)

16. A rod of length 1 has its ends A and B kept at 0°C and 100°C, respectively, until steady state conditions prevail. If the temperature at B is reduced suddenly to 0° C and kept so, while that of A is maintained, find the temperature u(x, t) at a distance x form A and at time t.

17. Find the steady state temperature at any point of a square plate if the two adjacent edges are kept at 0°C and others at 50°C.

(or)

18. Explain the method of separation of variables for solving two dimensional Laplace Equation in polar coordinates.

19. (a) State and prove shifting property on Fourier Transforms.

    (b) Using Parseval's Identity, evaluate $\int_0^\infty x^2 \frac{dx}{(a^2 + x^2)^2}$

(or)

20. (a) state and prove the convolution theorem on Fourier Transforms.

    (b) Find the Fourier Transform of $f(x) = \begin{cases} x, & for \mid x + < a \\ 0, & for \mid x \mid > a \end{cases}$