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

Course & Branch: B.E – EEE
Title of the paper: Engineering Mathematics - III
Semester: III Max. Marks: 80
Sub.Code: 514301 Time: 3 Hours
Date: 26-11-2007 Session: AN

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

1. Find L[coshat sinat].

2. Find $L^{-1}\left(\frac{1}{s^2+2s+2}\right)$.

3. State Dirichlet's conditions.

4. What is the sine series of f(x) = K in $0 < x < \pi$.

5. Obtain partial differential equation by eliminating arbitrary constants a and b from $(x-a)^2 + (y-b)^2 + z^2 = 1$.

6. Write the particular integral in the solution of $(D^2 + 3DD' + 4D'^2) = e^{x-y}$.

7. In the heat equation $U_t = \alpha^2 U_{xx}$, what does α^2 stand for?

8. Write the partial differential equation of two dimensional heat flow in steady state conditions.

9. State parseval's relation for Fourier transforms.

10. Show that $F_s\{f'(x)\} = -sF_c(s)$.

PART – B (5 x 12 = 60)

Answer All the Questions

11. (a) Find the Laplace Transform of the following periodic function

$$f(t) = \begin{cases} \sin at & \text{for } 0 < t < \frac{\pi}{a} \\ 0 & \text{for } \frac{\pi}{a} < t < \frac{2\pi}{a} \text{ and} f\left(t + \frac{2\pi}{a}\right) \end{cases}$$

(b) Find the Laplace transform of $t\,e^{2t}\sin 3t$.

(or)

12. (a) Find the inverse Laplace transform of the following function using convolution theorem $\dfrac{1}{s^3(s+5)}$

(b) Solving using Laplace transform: $(D^2 + 4D + 4)y = \sin t$, given that $y(0) = 2$ and $y'(0) = 0$.

13. (a) determine the Fourier series for the function $f(x) = x^2$ is of period 2π in $0 < x < 2\pi$.

(b) Find the complex form of Fourier series for the function $f(x) = e^{-x}$ in $-1 < x < 1$.

(or)

14. (a) Find the half range cosine series for the function $f(x) = x(\pi - x)$ in $0 < x < \pi$.

(b) Find the constant term and the first harmonic of the fourier series for f(x) from the following data:

x:	0	60°	120°	180°	240°	300°	360°
F(x):	15.5	19.5	24.5	22.5	20.5	17.5	15.5

15. (a) Find the singular integral of the partial differential equation $z = px + qy + p^2 - q^2$.

(b) Solve $(D^2 + 4DD' - 5D'^2)z = \sin(x - 2y)$.

(or)

16. (a) Find the general solution of $(3z - 4y)\,p + (4x - 2z)\,q = 2y - 3x$.

(b) Form the partial differential equation by eliminating f and g form $z = y\,f(x) + x\,g(y)$.

17. If a string of length l is initially at rest in equilibrium position with fixed end point's and if each of its point's is given the velocity $\lambda x(l - x)$, determine the displacement function $y\,(x,t)$.

(or)

18. A rectangular plate with insulated surface is $l$cm wide and so long compared to its width that it may be considered infinite in length without introducing an appreciable error. If the temperature of the short edge y = 0 is given by $u = \begin{cases} kx & for\, 0 < x < \frac{l}{2} \\ k(l - x) & for\, \frac{l}{2} < x < l \end{cases}$ and the remaining three edges are kept at 0°C find the steady state temperature in the plate.

19. Find the fourier transform of f(x) given by $F(x) = \begin{cases} 1 & for\ |x| < 2 \\ 0 & for\ |x| > 2 \end{cases}$ and hence evaluate

$$\int_0^{\infty} \left(\frac{\sin x}{x}\right) dx \qquad and \int_0^{\infty} \left(\frac{\sin x}{x}\right)^2 dx.$$

(or)

20. (a) Find the Fourier cosine transform $\frac{1}{1 + x^2}$.

(b) State and prove the convolution theorem for Fourier transforms.