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Anna University Exams Nov/Dec 2015 – Regulation 2013
Rejinpaul.com Unique Important Questions – 3rd Semester BE/BTECH
MA6351-TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS – Question Wise

Rejinpaul.com Important Note: Below Questions May Be Asked with Same Data Values or Different Data Values, Students are advised to practice Similar Model Questions From Below Questions - Admin

UNIT -1 PARTIAL DIFFERENTIAL EQUATIONS

1. Solve $x(y^2+z^2)p + y(z^2+x^2)q = z(y^2-x^2)$.
2. Solve $z = px + qy + \sqrt{1+p^2+q^2}$.
3. Solve $(D^3 + D^2D' - DD'^2 - D'^3)z = e^{2x+y} + \cos(x+y)$.
4. Form the partial differential equation by eliminating the arbitrary functions f and g in $z = x^2 f(y) + y^2 g(x)$.
5. Solve : $p^2y(1+x^2) = qx^2$

UNIT -2 FOURIER SERIES

1. Find the H.R cosine series for the function f(x)= x(π-x) in 0< x< π .Hence deduce that $\frac{1}{1^4}+\frac{1}{2^4}+\frac{1}{3^4}+\ldots\infty = \frac{\pi^4}{90}$
2. Find the Fourier series of f(x) = $\begin{cases} 1-x, & -\pi < x < 0 \\ 1+x, & 0 < x < \pi \end{cases}$. Hence deduces $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots\infty = \frac{\pi^2}{8}$
3. Find the half range sine series f(x) = x(π -x) in (0, π) and Deduce that $\frac{1}{1^3}-\frac{1}{3^3}+\frac{1}{5^3}+\ldots\infty$
4. Compute the first two harmonics of the Fourier series of y=f(x) from the data

X	0	π/3	2π/3	π	4π/3	5π/3	2π
f(x)	1.0	1.4	1.9	1.7	1.5	1.2	1.0

5. Find the Fourier series for f(x) = x^2 in $(-\pi, \pi)$ and hence find (i) $\frac{1}{1^4}+\frac{1}{2^4}+\frac{1}{3^4}+\ldots\infty$.(ii) $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\ldots = \frac{\pi^2}{12}$ (iii) $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\ldots = \frac{\pi^2}{6}$

UNIT -3 APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION

1. A string is tightly stretched and its ends are fastened at two points at x = 0, and x = *l*. The midpoint of the string is displaced transversely through a small distance 'b'and the string is released from rest in that position. Find an expression for the transverse displacement of the string at any time during the subsequent motion?
2. A tightly stretched string with fixed end points x=0 and x=*l* is initially at rest in its equilibrium position. If it is set vibrating by giving each point a velocity kx(*l*-x). Find the displacement of the string at any time.
3. The ends A and B of a rod *l* cm long have the temperature 40^0C and 90^0C until steady state prevails. The temperature at A is suddenly raised to 90^0C and at the same time that at B is lowered to 40^0C. Find the temperature distribution in the rod at time t. Also show that the temperature at the mid point of the rod remains unaltered for all time, regardless of the material of the rod.
4. A rectangular plate with insulate surface is 10cm wide and so long compared to it's with that it may be considered infinite in length without introducing appreciable error. Temperature at short edge y = 0 is given u = $\begin{cases} 20x \text{ for } 0 \le x \le 5 \\ 20(10-x) \text{ for } 5 \le x \le 10 \end{cases}$ and all the other three edges are kept at 0° c. Find the steady state temperature at any point in the plate.

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UNIT 4 – FOURIER TRANSFORMS

1. Show that Fourier Transform of $f(x)=\begin{cases}a^2-x^2; in|x|\le a\\ 0, in|x|>1\end{cases}$ **is** $\frac{2\sqrt{2}}{\pi}\left(\frac{\sin as - as\cos as}{s^3}\right)$**. Hence deduce that** $\int_0^\infty \frac{\sin t - t\cos t}{t^3}dt=\frac{\pi}{4}$**. Using Parseval's identity show that** $\int_0^\infty\left(\frac{\sin t - t\cos t}{t^3}\right)^2 dt=\frac{\pi}{15}$.

2. Evaluate (i) $\int_0^\infty \frac{dx}{(x^2+a^2)(x^2+b^2)}$ **(ii)** $\int_0^\infty \frac{dx}{(x^2+a)^2}$ **(iii)** $\int_0^\infty \frac{x^2dx}{(x^2+a)^2}$ **(iv)** $\int_0^\infty \frac{x^2dx}{(x^2+a^2)(x^2+b^2)}$ **using Fourier Transform.**

3. Find the Fourier Transform of $e^{-a|x|}$ **if a>0. Deduce that** $F\left[xe^{-a|x|}\right]=i\sqrt{\frac{2}{\pi}}\frac{2as}{(a^2+s^2)^2}$.

4. Find the Fourier Transform of f(x) given by f(x) = $\begin{cases}a-|x|, \ for|x|<a\\ 0, \quad for|x|>a>0\end{cases}$ **Hence show that**

(i) $\int_0^\infty\left(\frac{\sin t}{t}\right)^2 dt=\frac{\pi}{2}$ **(ii)** $\int_0^\infty\left(\frac{\sin t}{t}\right)^4 dt=\frac{\pi}{3}$

5. Find the Fourier Cosine Transform of $e^{-a^2x^2}$ **and hence find Fourier sine transform of** $xe^{-a^2x^2}$

UNIT- 5 Z TRANSFORMS

1. Using Z- transform solve $y_{n+2}+4y_{n+1}-5y_n=24n-8$ **given that** y_0 **=3 and** y_1 **=-5.**

2. Using convolution theorem evaluate inverse Z- transform of $\left[\frac{8z^2}{(2z-1)(4z+1)}\right]$

3. Find $Z(\cos n\theta) and Z(\sin n\theta)$

4.(i) Find the inverse Z-transform of $\frac{z(z+1)}{(z-1)^3}$ **by Residue method.(ii)Find** $Z^{-1}\left[\frac{z(z^2-z+2)}{(z+1)(z-1)^2}\right]$ **by partial fraction method.**

5.State and prove intial and final value theorem also prove Convolution theorem

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MA6351-TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS - Topicwise

UNIT 1 PARTIAL DIFFERENTIAL EQUATIONS	
1	LAGRANGES LINEAR PARTIAL DIFF EQUATION
2	CLAIRAUTS METHOD TO SOLVE PDE (TYPE-2)
3	SOLVING HOMOGENEOUS AND NON-HOMOGENEOUS PDE
4	FORMING PDE BY ELIMINATION ARBITARTY CONSTANTS AND FUNCTION
UNIT 2 FOURIER SERIES	
1	HALF RANGE FOURIER SERIES WITH PARSEVALS IDENTITY
2	HARMONIC ANALYSIS
3	FOURIER SERIES FOR -EVEN OR ODD FUNCTION WITH CONTINUOUS POINT AND DISCONTINUOUS POINT
4	FOURIER SERIES FOR FULL RANGE
UNIT 3 APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION	
1	ONE DIMENSION WAVE EQUATION (GIVEN- INITIAL DISPLACEMENT OR INITIAL VELOCITY)
2	ONE DIMENSIONAL HEAT EQUATION (TYPE-2 AND TYPE-3)
3	TWO DIMENSIONAL HEAT EQUATION (INFINITE PLATE FOR HORIZONTAL AND VERTICAL PLATE)
UNIT 4 FOURIER TRANSFORMS	
1	Find Fourier Transform of $f(x) = \left\{\begin{matrix} a^2 - x^2; in\lvert x\rvert \le a \\ 0, in\lvert x\rvert > 1 \end{matrix}\right\}$
2	FIND FOURIER TRANSFORM FOR SELF –RECIPROCAL PROBLEMS
3	Find the Fourier Transform of f(x) given by f(x) = $\begin{cases} a - \lvert x\rvert, & for\lvert x\rvert < a \\ 0, & for\lvert x\rvert > a > 0 \end{cases}$
4	Evaluate (i) $\int_0^\infty \frac{dx}{(x^2+a^2)(x^2+b^2)}$ (ii) $\int_0^\infty \frac{dx}{(x^2+a)^2}$ (iii) $\int_0^\infty \frac{x^2dx}{(x^2+a)^2}$ (iv) $\int_0^\infty \frac{x^2dx}{(x^2+a^2)(x^2+b^2)}$ using Fourier Transform.
5	Find the Fourier Cosine Transform of $e^{-a^2x^2}$ and hence find Fourier sine transform of $xe^{-a^2x^2}$
UNIT 5 Z TRANSFORMS	
1	SOLVE DIFFERENCES EQUATION
2	CONVOLUTION PROBLEMS
3	CONVOLUTION STATEMENT AND PROOF
4	FIND INVERSE Z-TRANSFORM BY RESIDUE AND PARTIAL FRACTION METHODS
5	PROBLEMS IN Z-TRANSFORM.

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