Roll No. | | | | | | | | | | | 3

B.E. /B.Tech(Part Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2013

Common to all branches

Second Semester

PTMA 231 – MATHEMATICS –II / PTMA 271 – MATHEMATICS – III / PTMA 9212 – TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

(Regulation 2002/2005/2009)

Time : 3 Hours Answer ALL Questions Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. State the Dirichlet's conditions for a function f(x) in a Fourier series defined in $\alpha<x<\alpha+2\pi$.

2. Define a harmonic analysis in a Fourier series.

3. If F(s) is the Fourier transform of f(x), what is the Fourier transform of f(x-a).

4. Find the Fourier sine transform of e^{-x}.

5. Form the partial differential equation by eliminating the arbitrary function from $\emptyset(\frac{x}{y}, \frac{y}{z}) = 0$.

6. Find the complete solution of $pq + p + q = 0$.

7. Write the steady-state solutions of a two-dimensional heat equation .

8. The partial differential equation of a vibrating string is $\partial^2u/\partial t^2 = a^2\ \partial^2u/\partial x^2$. What is a^2.

9. Find the Z-transform of n.

10. If Z{f(n)} = F(z), then find $Z\{a^n f(n)\}$.

Part B (5 X 16 = 80 Marks)

11. (i). Verify convolution theorem for the sequences $\{1^n\}$ and $\{n^2\}$. (8 Marks)

(ii). Solve $u_{n+2} - 5u_{n+1} + 6u_n = (-1)^n$ with $u_0 = u_1 = 0$. (8 Marks)

12.(a). (i). Obtain the Fourier series of period 2 L for the function f(x) = $|x|$ in - L≤ x ≤ L. (8 Marks)

(ii). Find the half-range cosine series for $\sin x$ in $(0,\pi)$. (8 Marks)

(OR)

(b). (i). Find the Fourier series as far as the second harmonic to represent the function given in the following data. (8 Marks)

x	0	1	2	3	4	5
f(x)	9	18	24	28	26	20

(ii). Expand x (2π – x) as a Fourier series in (0, 2π). (8 Marks)

13.(a). Find the Fourier cosine and sine transforms of x^{n-1}, a>0. Also find the Fourier cosine transform of $e^{-a^2x^2}$ and hence evaluate Fourier sine transform of x $e^{-a^2x^2}$. (16 Marks)

(OR)

(b).(i). Find the Fourier transform of

$$f(x) = \begin{cases} 1, & if|x| < a \\ 0, & if|x| > a > 0 \end{cases}$$

and hence evaluate $\int_0^\infty (\frac{\sin x}{x})dx$ and $\int_{-\infty}^\infty (\frac{\sin as \cos sx}{s})ds.$ (12 Marks)

(ii). For the problem in 13.(b).(i).use Parseval's identity to find $\int_0^\infty (\frac{\sin t}{t})^2 dt.$ (4 Marks)

14. (a). (i). Find the general solution of the partial differential equation
$x(y^2 - z^2)p + y(z^2 - x^2)q = z(x^2 - y^2)$. (8 Marks)

(ii). Solve $z = p^2 + q^2$. (8 Marks)

(OR)

(b). (i). Solve $(D^2 - 6DD' + 5D'^2)z = e^x \sinh y + xy$. (8 Marks)

(ii). Solve $z = px + qy + \sqrt{1 + p^2 + q^2}$. (8 Marks)

15. (a). A rod of length 30 cms has its ends A and B kept at 20 ˚C and 80 ˚C respectively, until steady-state conditions prevail. If the temperature at each end is then suddenly reduced to 0 ˚C and maintained so, find the temperature u(x, t) at a distance x from A at time. (16 Marks)

(OR)

(b). A tightly stretched string of length l has its ends fastened at x=0, x= l. The midpoint of the string is then taken to height h and then released from rest from that position. Find the lateral displacement of a point of the string at time t from the instant of release. (16 Marks)

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