Course Name: Mathematics 2

Course Code: 15B11MA211

Maximum Marks: 20

Maximum Time: 1 Hr.

After pursuing this course, the students will be able to:

CO1	explain different methods for solving ordinary differential equations of second order.
CO2	apply different tests/methods of convergence for infinite series.
CO3	solve series solution of differential equations, Legendre's polynomials and Bessel's functions.
CO4	identify the partial differential equations and apply Fourier series to solve them.
CO5	explain the concept of singularities, residues and transformations.
CO6	apply the concept of complex variables to solve the problems of complex differentiation and integrations.

Note: Attempt all the questions.

Q1. Solve the differential equation $y'' - 2y' + y = \dfrac{e^x}{x}$, $x > 0$ by using variation of parameters method. **[4, CO1]**

Q2. Find the part of complimentary function and use it to solve the differential equation $x^2 y'' - 2x(1+x)y' + 2(1+x)y = 0$ **[4, CO1]**

Q3. Discuss the nature of $x = 0$ for the differential equation $y'' - xy' + x^2 y = 0$ and also find its series solution about $x = 0$. **[4, CO3]**

Q4. Classify the following infinite series as absolute or conditionally convergent **[3, CO2]**

$$\frac{1}{\sqrt{2}+\sqrt{1}} - \frac{1}{\sqrt{3}+\sqrt{2}} + \frac{1}{\sqrt{4}+\sqrt{3}} - \cdots$$

Q5. Test the convergence of the following infinite series **[1+2, CO2]**

(i) $\displaystyle\sum_{n=1}^{\infty} \frac{n^3}{n^{9/2}+1}$,

(ii) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{n+1}{n+2}\right)^n$

Q6. Test for uniform convergence of the series $\displaystyle\sum_{n=1}^{\infty} \frac{\sin(nx^2 + 2x^2)}{n(n+2)}$, $x \in R$ **[2, CO2]**

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