



M 27249

Reg. No. :

Name :

II Semester M.A./M.Sc./M.Com Degree (Reg./Sup./Imp.)
Examination, March 2015
(2014 Admn. Onwards)
Physics
PHY2C07 – MATHEMATICAL PHYSICS – II

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer both questions (Either **a** or **b**). Each question carries **12** marks.

1. a) What is the Leibnitz criterion for convergence of an alternating series. Show that the series $1 - 1/\sqrt{2} + 1/\sqrt{3} - 1/\sqrt{4} + \dots$ converges.
b) Solve the Laplace' equation in three dimensions by the method of separation of variables.
2. a) Derive the convolution theorem of Fourier Transforms find the Fourier transform of the function defined by $f(x) = 1$ for $|x| < 1$ and $f(x) = 0$ for $|x| > 1$.
b) Derive the orthogonality theorem assuming Schur's Lemmas. What is meant by orthogonality of characters ?

SECTION – B

Answer **any four**. **1** mark for Section **a**, **3** marks for Section **b**, and **5** marks for Section **c**.

3. a) What is meant by absolute convergence of a series ?
b) Give an example for an oscillatory series.
c) Discuss the convergence of $1 + x^2/2! + x^3/3! + \dots$
4. a) Define Green's Function.
b) Prove the symmetry of Green's function.
c) Obtain the eigen function expansion of Green's function.

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5. a) Define Laplace' transform.
- b) Explain the change of scale property of Laplace' transform.
- c) Find the Laplace' transform of $e^{2t} \cos^2 t$.
6. a) Write down a first order linear P D E.
- b) Mention a few contexts in Physics where Laplace' equation occurs.
- c) Solve the wave equation in three dimensions by the method of separation of variables.
7. a) Define discrete Fourier transform.
- b) What is meant by Fourier cosine transform ?
- c) If $f(s)$ is the Fourier transform of $f(x)$ show that $F\{f(x) \cos ax\} = 1/2 [f(s+a) + f(s-a)]$.
8. a) What are cosets ?
- b) Explain isomorphism.
- c) Develop the character table of C_{4v} .

SECTION - B

Answer any four. 1 mark for Section a, 3 marks for Section b, and 5 marks for Section c.

1. a) What is meant by absolute convergence of a series ?
- b) Give an example for an oscillatory series.
- c) Discuss the convergence of $1 + x^2/2! + x^4/4! + \dots$
2. a) Define Green's Function.
- b) Prove the symmetry of Green's function.
- c) Obtain the eigen function expansion of Green's function.