K18P 0127

Reg. No. : .....

Name : .....

**Second Semester M.Sc. Degree (Regular/Supplementary/Improvement) Examination, March 2018**

**PHYSICS**

**PHY2 C07 : Mathematical Physics – II**

**(2014 Admn. Onwards)**

Time : 3 Hours Max. Marks : 60

SECTION – A

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

1. a) State and prove Taylor's series expansion of functions. Also obtain the Maclaurin's series expansion of $\ln(1 + x)$.

   OR

   b) Using the method of separation of variables, solve one dimensional wave equation.

2. a) Using convolution theorem for Laplace transform, solve the equation of motion of driven oscillator with damping, $mX''(t) + bX'(t) + kX(t) = F(t)$ with initial conditions $X(0) = 0$ and $X'(0) = 0$.

   OR

   b) Explain irreducible representation of $C_{4v}$. **(2×12=24)**

SECTION – B

Answer **any four** (**1** mark for Part '**a**', **3** marks for Part '**b**', **5** marks for Part '**c**').

3. a) State Cauchy's root test for convergence of series.

   b) Discuss the convergence of $\sum_{n=0}^{\infty} \frac{1}{n(n+1)}$.

   c) State Leibnitz criterion for the convergence of an alternating series. What do you mean by absolute and conditional convergence ? Give examples in each case.

P.T.O.

4. a) What do you mean by a partial differential equation ? Write one dimensional heat equation.
   b) Classify a second order partial differential equation into hyperbolic, elliptic and parabolic equations. Give examples in each case.
   c) Solve the equation $-y'' = f(x)$ by Green's function method.
5. a) Define Fourier Transform.
   b) Find the Fourier sine transform of $e^{-at}$.
   c) State and prove convolution theorem in Fourier transform.
6. a) Find Laplace transform of $f(t) = \sin^2 3t$.
   b) Find Laplace transform of Dirac delta function.
   c) Find inverse Laplace transform of $\frac{1}{(s+2)(s+3)}$ by partial fraction method.
7. a) Define a group.
   b) Describe the elements of the permutation group on 3 symbols, $S_3$.
   c) Show that the $n^{th}$ root of unity form a cyclic group of order n under scalar multiplication.
8. a) What do you mean by representation of a group ?
   b) State Schur's lemma 1 and Schur's lemma 2.
   c) Explain the continuous groups O(3), SU(2) and SU(3). **(4×9=36)**

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