FYUGP B.Sc 4th Semester Sessional Examination 2026

Paper Code: PHY4400404

Paper Name: Mathematical Physics

Time: 90 minutes **Total marks: 30**

1. Answer the following questions: 1 x 5 =5
   a) Write the general form of a Fourier series.
   b) Define even function.
   c) Give a physical application of Partial Differential Equation.
   d) Give an example of a first-order PDE.
   e) What is the singularity of a function? Explain with an example.

2. Answer the following questions: (any five) 5 x 5 =25
   a) State Dirichlet's conditions for Fourier series.
   b) Show that $b_n = 0$ for an even function.
   c) Solve Laplace's equation in 2D Cartesian coordinate system.
   d) Find Fourier series of a sawtooth wave.
   e) Find the Fourier series (sine and cosine form) for the function $f(x) = x^2$ in the interval $(-\pi, \pi)$.
   f) Using the method of separation of variables, solve
   $$\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u \text{ , where } u(x,0) = 6e^{-3x}.$$
   g) Find the poles of i) $f(z) = \frac{1}{z^4+1}$
   ii) $f(z) = e^z$
   h) Find the residue of $f(z) = \frac{1}{(z^2+1)^3}$ at $z = i$.

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FYUGP B.Sc 6th Semester Sessional Examination 2026

Paper Code: PHY-0600404

Paper Name: Statistical Mechanics

Time: 90 minutes **Total marks: 40**

1. Answer the following questions: 1 x 5 =5
   a) What is Fermi energy?
   b) Write the Fermi–Dirac distribution function.
   c) What type of particles obey B–E statistics?
   d) What is Bose–Einstein condensation?
   e) What is the most probable distribution?

2. Answer the following questions: (any three) 3 x 5 =15

   a) Sketch the Fermi–Dirac distribution function vs energy and explain its features.
   b) What are bosons? Discuss their properties and give examples.
   c) Write any three differences between classical and quantum statistics.
   d) Find the number of distinct ways of arranging 6 bosons in 4 phase space cells.
   e) Discuss the properties of liquid helium.

3. Answer the following questions: (any two) 10 x 2 =20
   a) Derive the Fermi–Dirac distribution law.
   b) Apply Bose–Einstein statistics to blackbody radiation and derive Planck's radiation law.
   c) i) Show the different ways in which 2 particles can be distributed in 2 compartments as per
      1. M-B statistics 2. F-D statistics 3. B-E statistics
      ii) Six classical particles are distributed between two boxes. Find the number of microstates corresponding to the distribution: (a) (3, 3) (b) (5, 1) c) (2,4)

FYUGP B.Sc 6th Semester Sessional Examination 2026

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