

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

**CLASS: M. Sc./ ISc.**  
**BRANCH: Physics**

**SEMESTER : I/VII**  
**SESSION : MO/2025**

**SUBJECT: PH401 MATHEMATICAL METHODS IN PHYSICS**

**TIME: 3 Hours**

**FULL MARKS: 50**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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		CO	BL
Q.1(a)	State and construct Cauchy-Riemann conditions.	[5] 1	3
Q.1(b)	By the conformal mapping of $w = z^2$ , show that the rectangular hyperbola can be mapped as straight lines in the $w$ -plane.	[5]	
Q.2(a)	Establish the orthogonality property of Hermite Polynomials.	[5] 2	5
Q.2(b)	Get one recurrence relation of Bessel function of first kind, using its generating function.	[5]	
Q.3(a)	Define Fourier transform and solve it for delta function.	[5] 3	1
Q.3(b)	Find the equation for the simple harmonic motion. Use Laplace transform to get this equation.	[5]	
Q.4(a)	Define Covariant, Contravariant tensors and their algebraic properties.	[5] 4	1
Q.4(b)	Explain direct product of two tensors with a suitable example.	[5]	
Q.5(a)	Make a short note on 2D special unitary group (SU(2)).	[5] 5	2
Q.5(b)	Compare two groups which are isomorphic to each other.	[5]	

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