M 16905

Reg. No. : .....

Name : .....

First Semester M.Sc. Degree Examination, November 2009
PHYSICS (2009 Admission)
PH-101 : Mathematical Physics – I

Time: 3 Hours

Max. Marks: 50

SECTION – A

Answer **any two** questions. **Each** question carries **ten** marks.

1. Show that eigen values of Hermitian matrices are real and orthogonal to each other.
2. State and prove Cauchy's integral formula.
3. Show that $\cos x = J_0(x) + 2\sum_{n=1}^{\infty}(-1)^n J_{2n}(x)$.
4. Obtain the simple form of the second solution of a differential equation if one solution is known.

(2×10=20)

SECTION – B

Answer **any five** questions. **Each** question carries **three** marks.

5. Write down the transformation equations from rectangular co-ordinates to spherical polar and cylindrical co-ordinate systems.
6. If A and B are Hermitian matrices, show that AB+BA is also Hermitian.
7. What is contraction as applied to tensors ?
8. What is levi-civita symbol ?
9. State and prove residue theorem.
10. Explain the method of Frobenius to obtain series solution around a regular singular point.
11. Derive a relation between gamma function and beta function.
12. What is generating function for Hermite polynomials ? From it derive $H_2(x)$ and $H_3(x)$.

(5×3=15)

P.T.O.

SECTION – C

Answer **any three** questions. **Each** question carries **5** marks.

13. Transform $ds^2 = dx^2 + dy^2 + dz^2$ into spherical polar co-ordinates.

14. Show that velocity and acceleration are contravariant tensors.

15. Find the residue of $f(z) = ze^z/(z-a)^3$ at its pole.

16. Obtain series solution by the method of Frobeneus's to solve the second order differential equation.

17. Prove that recurrence relation.

    $XP'_n(x) - P'_{n-1}(x) = nP_n(x)$. **(3×5=15)**