M 20474

Reg. No. : .....

Name : .....

I Semester M.A./M.Sc./M.Com. Degree (Reg./Sup./Imp.) Examination, November 2011
PHYSICS (2009 Admn.)
PH – 101 : Mathematical Physics – I

Time : 3 Hours Max. Marks : 50

Instructions : 1) *Section – **A** : Answer **any two** questions. **Each** question carries **10** marks.*

2) *Section – **B** : Answer **any five** questions. **Each** question carries **3** marks.*

3) *Section – **C** : Answer **any three** questions. **Each** question carries **5** marks.*

SECTION – A

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

1. How are the cylindrical and spherical polar co-ordinates related to the Cartesian co-ordinates ? Specify the limits within which each co-ordinates can vary. Write down the laplacian operator in Cartesian co-ordinate and convert the expression to the cylindrical co-ordinates.

2. What do you mean by diagonalisation of a matrix ? Show that the necessary and sufficient condition for the reduction of two matrices to the diagonal form.

3. State and prove Cauchy's integral formula.

4. Obtain series solution of the Bessel differential equation of order 'n'. What are Bessel functions of the second kind ? **(2×10=20)**

P.T.O.

SECTION – B

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

5. Find the inverse of the matrix $\begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$.

6. Construct a scalar from the tensor A^{ij}_{kl}.

7. What is a metric tensor ? Determine the metric in cylindrical polar co-ordinates.

8. What is meant by singularity of a complex function ? Give its important classification.

9. Write the simple form of the second solution and explain the situation in which we use it.

10. Write the Hermite polynomial and determine $H_3(x)$.

11. Define β-function and show that $\beta\ (1/2, 1/2) = \Pi$.

12. Write down the orthogonal property of Bessel function. **(5×3=15)**

SECTION – C

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

13. Prove the a cylindrical co-ordinate system is orthogonal.

14. Show that δ_{ij} is not a tensor.

15. Determine the poles and the residue at each pole of the function $f(z) = z^2/(z-1)^2\ (z+2)$.

16. Using the method of separation of variables, solve $\partial u/\partial x = 2\partial u/\partial t + u$

    Where $u(x, 0) = 6\ e^{-3x}$.

17. Show that Legendre polynomials are orthogonal functions. **(3×5=15)**
