M 26479

Reg. No. : .....

Name : .....

I Semester M.A./M.Sc./M.Com. Degree (Reg./Supple./Imp.) Examination, November 2014
PHYSICS
(2013 and Earlier Admn.)
PH 101 : Mathematical Physics – 1

Time : 3 Hours Max. Marks : 50

SECTION – A

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

1. State and prove Cauchy's integral formula.
2. Derive Bessel's equations from that of Legendre.
3. What is Hermitian and Skew Hermitian matrices ? Show that every square matrix can be uniquely expressed as the sum of a Hermitian and Skew-Hermitian matrix. Also show that if H is a Hermitian matrix, then iH is Skew- Hermitian.
4. Derive the generating function of Laguerre polynomials. **(2×10=20)**

SECTION – B

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

5. If $u = 2x + 3$, $v = y - 4$, $w = z + 2$, show that u,v,w are orthogonal.
6. Define Hermitian and Orthogonal matrices, give one example of each type.
7. What is tensor ? Distinguish between a symmetrical and an anti symmetrical tensor.

P.T.O.

8. Find the poles and residues at the poles of $\frac{z}{\cos z}$.

9. To show that $\beta(m,n) = \beta(n,m)$.

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

11. Show that the matrix is orthogonal $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$.

12. Using Rodrigue's formula, prove that $\int_{-1}^{+1} P_0(x)\,dx = 2$. **(5×3=15)**

SECTION – C

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

13. For Bessel functions, prove that $J_{n+3} + J_{n+5} = \frac{2}{x}(n+4)\,J_{n+4}$.

14. Define metric tensor and determine metric tensor of spherical coordinates.

15. Find the residue of $\frac{z^4}{(z-1)^4(z-2)(z-3)}$ at $z = 1$.

16. What are Legendre Polynomials ? Show that $P_{2m}(0) = (-1)^m \frac{2m!}{2^m (m!)^2}$.

17. For Bessel function $J_n(x)$, Prove that $J_n(x) = \frac{1}{\pi}\int_0^{\pi} \cos(n\phi - x\sin\phi)\,d\phi$.

(3×5=15)