



M 26585

Reg. No. : B.G.P.S.P41506

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I Semester M.A./M.Sc./M.Com. Degree (Reg./Supple./Improve.)
Examination, November 2014

PHYSICS

(2014 Admn. Under CBSS)

PHY 1C 01 : Mathematical Physics – 1

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **both** questions, **either** (a) or (b).

1. a) With suitable example explain in detail Unitary and Orthogonal Matrices. If a square matrix A of order n has n linearly independent Eigen vectors, then a matrix P can be found such that $P^{-1}AP$ is a diagonal matrix.

OR

- b) Obtain an expression for Grad, Divergence and Curl in terms of Circular Cylindrical Coordinates.
2. a) Prove that Hermitian matrix remain Hermitian under unitary similarity transformation. If A and B are two square matrices and A is non-zero singular prove that $A^{-1}B$ and BA^{-1} have the same Eigen value.

OR

- b) Discuss the general solution of Bessel differential equation. Explain briefly the orthogonal property of Bessel function. (2×12=24)

P.T.



SECTION - B

Answer any four :

3. a) Give the advantages of curvilinear coordinate system.
 ✓ b) Obtain an expression for curl in spherical coordinate system.
 c) Briefly explain unit vectors in spherical coordinates.
4. a) Explain what is rank of a tensor.
 ✓ b) Show that every tensor of second rank can be resolved into symmetric and anti-symmetric Parts.
 c) With suitable example explain contraction. State and prove quotient law.
5. a) Explain order and degree of a differential equation.
 b) Solve the equation $\frac{d^2y}{dx^2} + \cot x \left(\frac{dy}{dx}\right) + 4 (\operatorname{cosec}^2 x)y = 0$.
 c) Discuss in detail the series integration method of the solution of Linear Differential Equations (Fresenius method).
6. a) Discuss Cauchy Integral formula.
 b) State and explain Laurent's theorem.
 c) Evaluate the following integral using residue theorem :
- $$\int_c \frac{4 - 3z}{z(z-1)(z-2)} dz \text{ Where } c \text{ is the circle } |z| = \frac{3}{2}.$$
7. a) Define Beta function.
 b) Define Gamma function. Derive the recurrence relation $\tau(n) = \frac{1}{n} \tau(n+1)$.
 c) Write down Bessel's differential equation and discuss in detail its solution.
8. a) What is Legendre Polynomial ?
 b) Show that $P_n(1) = 1$.
 c) Prove that $P_n(\cos \theta)$ can be expressed as a series consisting of cosines of even or odd integer multiples of θ .

$$\sqrt{n+1} = n\sqrt{n}$$

$$\sqrt{3+1} = 3\sqrt{2}$$

$$(1-2^n)^{1/2}$$

$$(4 \times 9 = 36)$$