PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2024
(Fifth Semester)

Branch – **PHYSICS**

MATHEMATICAL PHYSICS

Time: Three Hours Maximum: 50 Marks

SECTION-A (5 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (5 x 1 = 5)

1 0^{th} rank tensor is called .....
(i) scalar (ii) vector
(iii) matrix (iv) None of the above

2 Find an equation in spherical coordinates from a rectangular equation $x^2 + y^2 = z^2$
(i) 0 (ii) -1
(iii) 1 (iv) Infinity

3 If the order of the matrix is mxn, then how many elements will there be in the matrix?
(i) mn (ii) m^2n^2
(iii) mn^2 (iv) 2mn

4 If the Laplace transform of function f(t) is given by $S / (S^2 - 4)$ then the f(t) is
(i) Sin (2t) (ii) Cosh(2t)
(iii) Sinh(2t) (iv) Cos(2t)

5 If $u = x^2 - y^2$,then the conjugate harmonic function is
(i) 2xy (ii) x +y
(iii) 4xy (iv) x-y

SECTION - B (15 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

6 a Define tensor
OR
b State Gauss divergence theorem.

7 a Prove that div curl A = 0
OR
b Explain about orthogonal curvilinear coordinate.

8 a Compare unitary transformation and orthogonal transformation.
OR
b Explain the characteristics equation of a matrix.

9 a Define Fourier series.
OR
b Find Laplace transform of (t^n), n>-1

10 a Define continuity and differentiability.
OR
b Write conditions for Harmonic functions.

Cont...

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11 a Find a unit vector perpendicular to the surface $x^2 + y^2 - z^2 = 11$,at the point (4,2,3)

OR

b Derive the Christobel's 3 – index symbol.

12 a Discuss Differential operators in terms of orthogonal curvilinear co-ordinates.

OR

b Discuss Differential operators in terms of spherical polar curvilinear co-ordinates.

13 a Explain similarly transformation with an example.

OR

b Explain power of matrix with suitable examples.

14 a Discuss the Properties of Fourier's transform.

OR

b Derive Laplace transform of integral.

15 a Write the Cauchy – Riemann equations.

OR

b Determine the analytic function f (z) = u + iv where V = 6xy – 5x +3 express the result as a function of Z.

Z-Z-Z END