14PHU17

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2018
(Fifth Semester)

Branch - PHYSICS

MATHEMATICAL PHYSICS

Time ; Three Hours   Maximum : 75 Marks

SECTION-A (20 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** marks   (1 0 x 2 = 20)

1 State stokes theorem.

2 If $\vec{r}$ is position vector, find divergena of $\hat{r}$.

3 Give the expression for Laplaian in curvilinear co-ordinates.

4 Write the expressions for scalar factors in spherical polar coordinates.

5 If Aij is antisymmetric tensor, find the component A] $_t$.

6 Define 'Contravariant tensor' for first rank.

7 If z = xi + y, check whether the function |z| is analytic or not.

8 Give the definition of an analytic function.

9 Evaluate $\int_i^1 (z + 1)^2 dz$.

10 Give Cauchy's integral formula.

SECTION - B (25 Marks)

Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 5 = 25)

11 a State and prove Green's theorem in a plane.

OR

b Find $\nabla . r^n \vec{r}$ for the position vector $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$.

12 a Deduce the expression for gradient in curvilinear coordinates and hence drive it for spherical co-od system.

OR

b Derive the expression for curl in curvilinear coordinates.

13 a What is a Kronecker delta symbol? Give its properties.

OR

b Show that $A_H v B^{fl} C^v$ is an invariant if $B^\wedge$ and C^v are contra variant and $A^\wedge_v$ is a covariant tensor.

14 a Show that the real and the imaginary parts of the function log z satisfy Cauchy-Riemann equation when z is not zero.

OR

b Derive Laplace's equations.

Cont...

15 a Evaluate the integral d—$\frac{r\ dz}{z^2 + z}$ (C) where C b a circle & |z| = |R >|.

OR

b Find the pole and residue at the pole for the function-----------.
cosz

SECTION - C (30 Marks)

Answer any THREE Questions

ALL Questions Carry EQUAL Marks (3 x 10 = 30)

16 State and prove Gauss divergence theorem.

17 Derive the expression for divergence in curvilinear coordinates and hence deduce it in spherical coordinates.

18 i) Show that any tensor of rank 2 can be expressed as a sum of symmetric and antisymmetric tensor, both of rank 2.

ii) If A^u and Bv are the components of a contravariant and covariant tensor of rank one, show that = A^Bv are the componets of mixed tensor of rank one.

19 Obtain the necessary and sufficient conductions for the function f(z) to be analytic.

20 Stat and prove Cauchy's integral theorem.

Z-Z-Z END