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PSG COLLEGE OF ARTS & SCIENCE

(AUTONOMOUS) *WptfVIJ*

BSc DEGREE EXAMINATION MAY 2017

(Fifth Semester)

Branch- **PHYSICS**

MATHEMATICAL PHYSICS

Time : Three Hours Maximum : 75 Marks

SECTION-A (20 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (10x2 = 20)

1 Evaluate Curl $(V\,|$ where r = ix + jy + kz.
v r ;

2 Prove that cusl r = 0.

3 What are called orthogonal curvilinear coordinates?

4 Express the operator grad (V) in orthogonal curvilinear coordinate.

5 Write the co-variant tensor of rank one.

6 What is contraction of tensors?

7 What is continuous function?

8 Examine that |z| is analytic or hot.

9 State Cauchy's integral formula,

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

SECTION - B (25 Marks)

Answer **ALL** Questions

ALL Questions Carry **EQUAL** Marks (5x5 = 25)

11 a P.T div(r^n r) = (3 + n)r^n.

OR

b S.T. (i) div curl A = 0 (ii) Curl grad $\mathcal{S}$ = 0.

12 a Express the divergence in orthogonal curvilinear coordinates.

OR

b Express the divergence and gradient in spherical polar coordinates.

13 a Show that the transformations of tensors form a group.

OR

b Write down the properties of kronecker delta.

14 a Obtain Cauchy - Riemann equation in polar form.

OR

b Check that the following function is analytic or not. f(z) = z'[1]; z = x + iy.

15 a Write down the basic properties of the complex line integrals.

OR

b Evaluate $\int_C \frac{dz}{z}$ using Cauchy's integral theorem.

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 Express the following in cylindrical coordinates.
(i)Grad (ii) Div (iii) Laplacian (iv) Curl.

18 A covariant tensor has components xy, $2y-x^2$, xz in rectangular coordinates. Find its covariant components in spherical coordinates.

19 Examine that f(z) = e^{smz} is analytic or not.