14MAU05

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2018
(Second Semester)

Branch - **MATHEMATICS /**

ANALYTICAL GEOMETRY OF 3D & VECTOR CALCULUS

Time : Three Hours Maximum : 75 Marks

SECTION-A (20 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 x 2 = 20)

1 Write down the equation of a Pointer Sphere,
2 Find the equation of the sphere with centre (-1,2,-3) and radius 3 units.
3 Define a cone.
4 What is the condition for the plane lx+my+nz=0 to touch the quadric cone?
5 Define a right circular cylinder.
6 Write down the equation of tangent plane at **$(xi, y_{ls} Zi)$.**
7 Show that $r \times \frac{dr}{dt} = n a \times b$ whenever r=a cos nt+b sin nt where a,b and n are constants.
8 When w x r becomes solenoidal?
9 State Gauss's divergene theorem.
10 Find the value of $div(r^n.r)$

SECTION - B 125 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 5 = 25)

11 a Find the equation to the sphere through the four points (2,3,1), (5,-1,2), (4,3,-1) and (2.5,3).

OR

b Show that the intersection of the sphere and the plane $x^2+y^2+z^2-2x-4y-6z-2=0$ and x+2y+2z-20=0 respectively is a circle of radius with its centre at the point (2,4,5).

12 a Derive the equation for intersecting straight line and quadric cone.

OR

b Show that the equation of a right circular cone whose vertex is 0, axis oz and semi-vertical angle a is $x^2+y^2=z^2\tan^2 a$.

13 a Express the surface hyperboloid of two sheets and provide the condition for that surface.

OR

b Find the equations of the tangent planes to $x^2+y^2+4z^2=1$ which intersect in the line whose equations are 12x-3y-5=0 and z-1.

14 a Find the angle between the surfaces z=x +y -3 and x +y +z"=9 at (2,-1,2).

OR

b Find the unit tangent vector for the curve r=acosti+asintj+ctk.

15 a Evaluate $\int Adr$ where $A=(5xy-6x^2)i+(2y-4x)j$ and c is the curve $y=x^3$ in the xy plane from the point (1,1) to (2,8).

OR

b Find the area of the surface of the hemisphere $x+y^7+z^{"7}=a^7$, $z>^7 0$.

SECTION - C (30 Marks)

Answer any. **THREE** Questions
ALL Questions Carry **EQUAL** Marks (3 x 10 = 30)

16 Show that the locus of the centre of the sphere OABC is $\frac{}{x} + \frac{}{y} + \frac{}{z} = 2$ if a plane passes through a fixed point (a,b,c) and cuts the axes in A,B and C.

17 Find the equations of the tangent planes to the cone 9x -4y +16z =0 which contain the line $\frac{}{32} = \frac{}{72} = \frac{}{72}$

18 Find the equation of a right circular cylinder of radius 3 with axis
$\frac{x+2}{3} \quad \frac{y-4}{6} \quad \frac{z-1}{2}$

19 Prove that (i) curl (grad(]))=0 (ii) div curl F=0

20 Verify Green's theorem for $\int_c [(xy + y^2)dx + x^2dy]$ where c is the boundary of the common area between $y=x^2$ and $y=x$.

Z-Z-Z END