PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION DECEMBER 2018
(First Semester)

Branch - MATHEMATICS WITH COMPUTER APPLICATIONS

CALCULUS

Time: Three Hours   Maximum: 75 Marks
SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks   **(10 x 1 = 10)**

1   The curvature of the curve is given by

(i) |r'(0| (ii) jr'(r)j³ (iii) r'.r¹¹ (iv) None of the above

2   Mention the correct value of $^[u\{t).v\{t)]$

(0 . £(w(0)-v(0 + «(0-£(«(0) (ii) м'(0 (iii) v'(/) (iv) u(t)xv(t)

3   Evaluate f(3,2) where $f(x,y) =$
(i) 2   (ii) 3   (iii) 0   (iv) 1

4   If $f(x,y)=x^3+x^2y^3-2y^2$, then find fx(2,l).
(i) 12   (ii) 14   (iii) 16   (iv) 5

5   Write $\dfrac{dy}{dx}$ for the implicit function f(x,y)=0.

G)(fo $\dfrac{}{ox}$ (ii) $\dfrac{5F}{ox}$ (iii) $\dfrac{dF}{dy}$ (iv) - $\dfrac{dF\ dF}{ox\ ay}$

6   Define the directional derivative of f(x,y) at (x_0,yo) in the direction of a unit vector w =< a,b > .

(i) Vf   (ii) u (iii) т$\dfrac{Vf}{Vf}$.u   (iv) |Vfj

7   Write down the relationship between Cartesian co-ordinate and polar co-ordinate,
(i) x=rcos0 (ii) y=rsin0 (iii) x=eos0 (iv) x=rcos0, y=rsinQ

8   Write down the value of j $j_o^a xy^2 dxdy.$

(i) t   (ii) 1   (iii) 4   (iv) 5

9   Find the value of j j $_{0\ 0\ 0}^{abc} $^dxdydz.

(i) a²bc (ii) abc²   (iii) abc (iv) abc²

10   Write dowm the formula to convert from cylindrical to rectangular co-ordinate.
(i) (r, 0, (j)) to (x,y,z) (ii) drd0d(() = jjj.dxdydz (iii) dxdydz (iv) None of the above

SECTION - B (25 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5x5 = 25)

11 a Find the vector equation and parametric equations for the line segment that joins the 2 points (1,3,-2) and (2,-1,3).
OR

b   Find (i) the derivative of r(t) = (1 + t^J)i + te ^{r}j + sin2tk
and (ii) the unit tangent vector at the point t=0.

12 a Where is the function h(x,y)=arc tan(^) continuous?

13 a If z=e^xsinv, where x=st^2 and y=s^2t, find $\frac{\partial}{\partial r}$ and $\frac{d}{dt}$.

OR

b Prove that (0,0) is one critical point of the function f(x,y)=$10x^2y-5x^2-4y^2-x^4-2y^4$

14 a Evaluate the integral $\int \int \sin(y).dydx$.

OR

b Find the moment of inertia I_x,I_y and I_0 of a homogenous disk D with density $p(x,y) = P$, center the origin and radius "a".

15 a Find the cylindrical coordinates of the point with rectangular co-ordinates (3,-3,-7).

OR

b Convert spherical co-ordinates   into rectangular co-ordinates.

SECTION -C (40 Marks)
Answer ALL questions
ALL questions carry EQUAL Marks (5x8 = 40)

16 a Prove that the curvature of the curve given by the vector function is

$$K(t) = \frac{f'(t) x f''(t) i}{|F'(t)|^3}$$

OR

b Find the curvature of the parabola y=x^2 at the points (0,0), (1,1) and (2,4).

17 a Find $\frac{dz}{dx}$ and $\frac{dz}{dy}$ if $x^3+y^3+z^3+6xyz=1$.

OR

b Show that f(x,y)=$x.e^{xy}$ is differentiable at (1,0) and find its linearization there.

18 a If f(x,y,z)=x.sin(yz)
(i) Find the gradient of f   and
(ii) Find the diretional derivative of f at (1,3,0) in the direction of the vector
S = 1 + 2j-k.

OR

b Find the equation of the tangent plane and normal line at the point (-2,1,3) to

the ellipsoid $\frac{x^2}{■} + y^2 + \sim = 3$.

19 a Evaluate $\iint_D xydA$, where D is the region bounded by the line y=x-1 and the

parabola y^2=2x+6.

OR

b Find the volume of the solid that lies under the paraboloid z=x^2+y^2 above the
xy plane and inside the cylinder x^2+y^2=2x.

20 a A solid E lies within the cylinder x^2+y^2=1, below the plane z=4 and above
the paraboloid z=$1-x^2-y^2$. the density at any point is proportional to its
distance from the axis of the cylinder. Find the mass of E.

OR

Evaluate $\iint_R (x^2+y^2+z^2)^2 dv$, where B is the unit ball