18MAU01

PSG COLLEGE OF ARTS & SCIENCE

(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2018

(First Semester)

Branch - **MATHEMATICS**

CALCULUS -I

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (10x1 = 10)

1 The plane determined by the normal and binormal vectors at a point P on a curve c is called_________ of C at P.
(i) Osculating plane (ii) Orthogonal plane (iii)normal plane (iv) binormal plane

2 The curve with parametric equations x=(4+sin 20t) cost, y=(4+sin 20t)sin t, z=cos20 t is called____ _.
(i) trefoil x not (ii) toroidal spiral (iii) twisted cubic (iv) helix

3 The function g(t)=arc tan t is_________ .
(i) continuous everywhere (ii) discontinuous
(iii) continuous except where x=0 (iv) discontinuous except where x=0

4 If f(x,y.) = sinf^), then § =_________.

(0 (‘>)cos(iip (“>) sin (irp-fly <iv) sinj^

5 If f(x,y,z)=x sin yz, then gradient of f is____
(i) (sin yz, x cos yz, xy cos yz) (ii) (sin yz, xz cos yz, y cos yz)
(iii) (sin yz, xz cos yz, xy cos yz) (iv) (sin yz,-xz cos yz, xy cos yz)

6 If f has a local maximum or minimum at (a,b), then (a,b) is a____ of f.
(i) Critical point (ii) Minimum point (iii) Maximum point (iv) Extreme point

7 The moment of inertia of a particle of mass m about an axis which is at a distance r from the particle is defined to be_____ _ .
(i) mr (ii) r^2 (iii) mr^2 (iv) mr^J

8 The moment about the y axis is_______ .
(i) Jfxyp(x,y)dA (ii) {{xp(x,y)dA (iii) fjyp(x,y)dA (iv) j|p(x,y)dA
D D D D

9 A solid region E is said to be of_______ if it lies between the graphs of two continuous functions of x and y.
(i) type I (ii) type II (iii) type III (iv) type IV

10 If the density is constant, then the center of mass of the solid is called the _____ of the region E.
(i) inertia (ii) Center (iii) moment (iv) centroid

SECTION - B (25 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5x5 = 25)

11 a Show that the curvature of the circle of radius a is $\frac{1}{a}$.

OR

b Bring out the length of the arc of the circular helix with vector equation

r(t)=cosi+sintj+tk from the point (1,0,0) to the point (1,0,2 re).

12 a If $f(x,y)=x^3+x^2y^3-2y^2$, then calculate fx(2,l) and fy(2,l).

OR

b Show that $f(x,y)=xe^{xy}$ is differentiable at (1,0) and find its linearization there. Then analyze to approximate f(1.1,-0.1).

10 iv<= T) ftx vl if ftx.vl=x -3xv+4v and u is the

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

to the ellipsoid A- + y^2 +~ = 3.

14 a Solve JJ(3x + 4y)dA, where R is the region in the upper half-plane bounded R

by the circles x^2+y^2;:=l and $x^2+y^2=4$.

OR

b Apply a double integral to find the area enclosed by one loop of the four leaved rose r=cos20.

15 a Calculate JjJe^x+y ^ 2 dv, where B is the unit ball: B

B={(x,y,z):$x^2+y^2+z^2$<l).

OR

b Evaluate J J 2 V4-X² 2 J(x^2+y^2)dzdydx.

-2-V4-x² -y/x² +y²

SECTION -C (40 Marks!

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 8 = 40)

16 a Develop the unit normal and binormal vectors for the circular helix r(t)=cost i+sint j+tk.

OR

b Show that the curvature of the curve given by the vector function r is

k(t) = jr' (t)xr'' (t) / r'(.)³

17 a Discuss (x,y) lim >(0,0) •3-^- if it exists. x +y²

OR

b If f(x,y) – xy / x²+y² , then justify (x,y)- lim ->(0,0) f(x,y) exist?

18 a Discover the directional derivative of the function f(x,y)=x y -4y at the point (2,-1) in the direction of the vector v = 2i + 5 j.

OR

b Discover the maximum value of the function f(x,y,z)=x+2y+3z on the curve of the insertion of the plane x-y+z=l and the cylinder x^2+y^2=l.

19 a Discover the mass and center of the mass of a triangular lamina with vertices (0,0), (1,0) and (0,2) if the density function is p(x,y) = 1 + 3x + y.

OR

b If the joint density function for x and y is given by

f(x,y)=i fc(x + 2y) ifO < x < 10,0 < y < 10; 0 otherwise — discover the value of the constant C. Find P(x<7,y>2).

20 a Examine the centre of mass of a solid of constant density that is bounded by the parabolic cylinder $x=y^2$ and the planes x=z, z=0 and x=l.

OR

b Identify the integral fje^"y-)dA, where R is the trapezoidal region with vertices fl.OL (2.0). (0,-2) and (0,-1).

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