PSG COLLEGE OF ARTS & SCIENCE (AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2018

(First Semester)

Branch - MATHEMATICS

CALCULUS

Time : Three Hours

Maximum : 75 Marks

SECTION-A (20 Marks! Answer ALL questions ALL questions carry EQUAL marks

 $(10 \times 2 = 20)$

- 1 If $x^3+y_J^3$ -3axy, find dx
- 2 Define Centre of Curvature.
- 3 What is the radius of Curvature of a (i) Straight line (ii) Circle.
- 4 Define evolute of a curve.
- 5 If f(x) is an odd function of x then prove that jf(x)dx = 0.
 - a

6 Evaluate J(logx) dx.

7 Find the value of
$$J^{a} (x^{h} + y^{2}) dx dy$$
.
0-b

- 8 Evaluate $JJJxy^{\overline{z}dzdydx}$. O i l
- 9 Prove that (3(m,n)=(3(n,m)).
- 10 Prove that T(1 / 2) = yfn.

SECTION - B (25 Marks)

Answer ALL Questions

- ALL Questions Carry EQUAL Marks (5x5 = 25)
- 11 a Find the maximum and minimum values of the function $f(x,y)=xy-x^2-y^2-2x-2y+4$. OR b If $u=x^3y^2$ where $x^2-xy+y^2=a^2$. Find du/dx.

12 a Prove that the radius of Curvature of any point of the Cycloid is $x=a(9+\sin 9)$ and $y=a(1-\cos 9)$ is 4a cos⁻.

OR

- b Find the radius of the curvature of the curve $4ay^2 = (2a x^3) at (a, -|)$.
- 13 a Prove that $J9\sin^3 9d9 = 0$

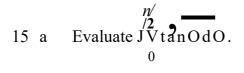
OR

b Find the reduction formula for [tan¹¹ xdx.

14 a Evaluate [f(x² + y ^)dxdy, over the region for which x,y are each>0 and x+y<l. OR
b Evaluate jjjxyz dx dy dz, taken through the positive octant of the sphere

 $x^2+y^2+z^2=a^2$.

Cont...



OR

15 b Evaluate $j^x^4 e^x dx$.

<u>SECTION - C (30 Marks)</u> Answer any THREE Questions ALL Questions Carry EQUAL Marks (3x10 = 30)

16 Using Lagrange's method of multipliers, to find the minimum value of $u=a^3x^2+b^3y^2+c^3z^2$ where l/x+l/y+l/z=l.

17 Find the evolute of the el lipse
$$\sim \frac{v_+^2 v_-^2}{a^2 b^2} = 1$$
.

- 18 Derive the reduction formula for the $jx^m(\log x)^n dx$ integral and hence evaluate $J(\log x)^3x^4 dx$.
- 19 Change the order of integration in the following integral and evaluate it: a 2a-x J Jxydydx. *x²/
- 20 Derive the relation between Beta and Gamma function.

Z-Z-Z END