PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS) '

BSc DEGREE EXAMINATION MAY 2017
(First Semester)

Branch - MATHEMATICS WITH COMPUTER APPLICATIONS

CALCULUS

Time : Three Hours * . Maximum : 75 Marks

SECTION-A (20 Marks)

Answer ALL questions
4
ALL questions carry EQUAL marks (1 0 x 2 = 20)

1 When will a function f(x, y) has minimum value of x = a,‘y = b?

2 State Legrange’s method.

3 Give the Cartesian formula for the radius of curvature.

4 Find $\frac{dy}{dx}$ when x = a(cost +1 sint), y = a(sint -1 cost). •

- ⁿ⁄2

5 Prove that **Jsin¹¹** x dx = **Jcosⁿ** x dx.

6 • Evaluate Jsin⁶ j
0
-
3 2
7 Evaluate JJxy(>
0 1
a x .
8 Evaluate * f J(x ² -
oo •

9 Find T(l).

10 Give the relation

SECTION - B (25 Marks)

Answer ALL Questions
ALL Questions Carry EQUAL Marks (5 x 5 = 25)

11 a Give the working rule to examine a function u = f(x, y) for maxima and mimima.

OR

b Discuss the maxima and minima of the function x y (6 - x - y).

12 a Show that in the parabola y^2 = 4ax at the poinLt, p = -2a(l +1²

OR

b Find the radius of curvature of the cardiod r = a(l - cos0).

Cont...

13 a Prove that $\int_0^{\pi/2} \sin^3\theta \, d\theta = \frac{2}{3}$.

OR

b Derive the reduction formula for $I_n = \int \sin^n x \, dx$.

14 a Evaluate $\iint (x^2 + y^2)\, dx\, dy$ over the region for which x, y are each > 0 and $x + y < 1$.

OR

b Evaluate $\int_0^1 \int_{y^2}^{2-y} x^2 \, dx\, dy$.

15 a Express $\int x^m (1 - x^n)^p \, dx$ interms of Gamma functions.

OR

b Evaluate $\int_0^{\pi/2} \sin^{10}\theta \, d\theta$.

SECTION - C (30 Marks)

Answer any THREE Questions

ALL Questions Carry EQUAL Marks (3 x 10 = 30)

16 If $u = a^3x^2 + b^3y^2 + c^3z^2$ where $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$, find the minimum value of u.

17 Find the evolute of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

18 Derive the reduction formula for $\int_0^{\pi/2} \sin^m x \cos^n x \, dx$.

19 Evaluate $\iiint xyz \, dx\, dy\, dz$ taken through the positive octant of the sphere $x^2 + y^2 + z^2 = a^2$.

20 Prove that $\iiint \frac{dx\, dy\, dz}{(1 - x^2 - y^2 - z^2)^{1/2}} = \frac{\pi^3}{8}$, the integration extended to all positive values of the variables for which the expression is real.

Z-Z-Z END