Reg. No……………………………………. Name…………………………………… **17U316**

B. Sc. DEGREE END SEMESTER EXAMINATION OCTOBER 2017

SEMESTER **– 3 : CORE COURSE FOR MATHEMATICS AND COMPUTER APPLICATIONS**

COURSE: **15U3CRMAT3-15U3CRCMT3; CALCULUS**

(For Regular - 2016 Admission and Supplementary / Improvement 2015 & 2014 Admission)

Time: Three Hours Max Marks: 75

PART A

Answer all questions. Each question carries 1 mark

1. Expand log (a + x) by Taylor's theorem.
2. Find the n^{th} derivative of $y = a^{mx}$.
3. Define envelope of a one parameter of family of curves.
4. Show that $f(x, y, z) = x^2 + y^2 - 2z^2$ satisfies Laplace equation.
5. Define critical point of a function f(x, y).
6. Find the length of the curve x = cost, y = t + sint, $0 \le t \le \pi$
7. Write surface area formula for revolution about y axis.
8. Find the volume of the solid generated by revolving the region $y = x^2$, y = 0, x = 2.
9. Find a spherical coordinate equation for the cone $z = \sqrt{(x^2 + y^2)}$.
10. Find the area of the region *R* bounded by y = x +2 and $y = x^2$ using double integrals.

(1 x 10 = 10)

PART B

Answer any eight questions. Each question carries 2 mark

11. Find the radius of curvature of the cycloid x = a (t + sint) , y = a (1 - cost).
12. Determine the points of inflexion of the curve $y = x^4 - 6x^3 + 12x^2 + 5x + 7$.
13. Find all second order partial differential equation of the function f(x, y) = x + y + xy.
14. Find dw/dt if $w = xy + z$, $x = \cos t$, $y = \sin t$, $z = t$.
15. Express w_r and w_s in terms of *r* and *s* if $w = x + 2y + z^2$, $x = r/s$, $y = r^2 + \ln s$, $z = 2r$.
16. Find the length of the curve $y= (1/3)(x^2 + y^2)^{3/2}$ from x = 0 to x = 3.
17. Find the area of surface of the region generated by revolving the curve $x = y^3/3$, $0 \le y \le 1$ about x axis.
18. Find the limits of integration for integrating f(r, θ) over the region *R* that lies inside the cardioid r = 1+ cosθ and outside the circle r = 1.
19. Evaluate the cylindrical coordinate integral $\int_0^{2\pi} \int_0^3 \int_{\frac{r^2}{3}}^{\sqrt{18-r^2}} dz\, r\, dr\, d\theta$.
20. Reverse the order of integration, and evaluate the integral $\int_0^{\pi} \int_x^{\pi} \frac{\sin y}{y} dy dx$.

(2 x 8 = 16)

PART C

Answer any five questions. Each question carries 5 mark

21. Find all the asymptotes of the curve $x^3 - x^2y - xy^2 + y^3 + 2x^2 - 4y^2 + 2xy + x + y + 1 = 0$.
22. Obtain the evolute of the parabola $y^2 = 4ax$.
23. Find the absolute maximum and minimum values of $f(x, y) = 2 + 2x + 2y - x^2 - y^2$ on the triangular region in the first quadrant bounded by the lines x = 0, y = 0, y = 9 – x.
24. Find the volume of the solid generated by revolving the region between the parabola $x = y^2 + 1$ and the line x = 3 about the line x = 3.
25. Find the volume of the solid generated by the region bounded by the curve $y = x^2 + 1$ and the line y = -x +3 is revolved about the x axis.
26. Find the volume using triple integrals of the region in the first octant bounded by the cordinate planes and the surface $z = 4 - x^2 - y$.
27. Evaluate the integral $\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \int_{csc\phi}^{2} 5\rho^4 \, sin^3\phi \; d\phi d\theta d\rho.$

(5 x 5 = 25)

PART D

Answer any two questions. Each question carries 12 mark.

28. Find the n^{th} derivative of $y = \cos(m \sin^{-1}x)$ for x = 0.
29. Find the points closest to the origin on the hyperbolic cylinder $x^2 - z^2 - 1 = 0$.

30. a. Find the length of the curve $y = (x/2)^{2/3}$ from x = 0 to x = 2.
    b. Find the surface area of the cone frustum generated by revolving the line segment $y = (x/2) + (1/2)$, $1 \le x \le 3$ about the y axis.
31. Let D be the region bounded below by the cone $z = \sqrt{x^2 + y^2}$ and above by the plane z = 1. Set up the triple integrals in spherical coordinates that give the volume of D using the following orders of integration.
    a) $d\rho d\phi d\theta$
    b) $d\phi d\rho d\theta$

(12 x 2 = 24)

****