Reg. No……………………….……………………. Name…………………………………………… **18U320**

B. Sc. DEGREE END SEMESTER EXAMINATION - OCTOBER 2018

SEMESTER - **3: MATHEMATICS**

(CORE COURSE FOR B. Sc. MATHEMATICS AND B. Sc. COMPUTER APPLICATIONS)

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

(For Regular - 2017 Admission and Supplementary / Improvement 2016, 2015, 2014 Admissions)

Time : Three Hours Max Marks : 75

PART - A

Answer **all** questions. Each question carries 1 mark.

1. Find the nth derivative of sin (ax+b)
2. State Taylor's theorem
3. What is the relation between the evolute and envelope of a curve
4. Find ∂f/∂x if f(x,y)=sin(xy)
5. Find the critical points of f(x,y)=xy
6. Evaluate $\int_0^{\frac{\pi}{4}} tanxsec^2x \quad dx$
7. What is the length of the smooth curve x=g(y)) from y=c to y=d
8. State Pappus theorem for volumes
9. Evaluate$\int_0^3 \int_0^2 (4-y^2)$ dy dx
10. What is described by r = a in cylindrical co-ordinates (1 x 10 = 10)

PART - B

Answer **any 8** questions. Each question carries 2 marks.

11. If x= a cosθ y=b sinθ show that y_2=b/a^2 $cosec^3$θ
12. Find the envelope of $\frac{x}{\alpha}+\frac{y}{a-\alpha}=1,$ where a is a constant
13. If w=e^x+xlogy+ylogx show that $w_{yx}=w_{xy}$
14. If u=x^2+y^2, x=cost, y=sint, find $\frac{du}{dt}$
15. Draw a tree diagram for the chain rule for functions of 3 variables
16. Find the length of the curve x = 1 – t, y = 2+ 3t, -2/3 ≤ t≤ 1
17. Find the area of the region enclosed by x =2y^2, x = 0, y = 3
18. Write an equivalent integral with the order of integration reversed for $\int_0^1 \int_1^{e^x} dy\, dx$
19. Find a spherical co-ordinate equation for the cone z = $\sqrt{x^2+y^2}$
20. Evaluate$\int_1^e \int_1^e \int_1^e \frac{1}{xyz}\, dxdydz$

(2 x 8 =16)

PART - C

Answer **any 5** questions. Each question carries 5 marks.

21. Prove that $\tan^{-1} x = x - \frac{x^3}{3} + \frac{x^5}{5} - \cdots$
22. Find the centre of curvature of $y^2=4ax$
23. If $w=\tan^{-1}\frac{x}{y}$, $x=u\cos v$, $y=u\sin v$ find $\frac{\partial w}{\partial u}$ and $\frac{\partial w}{\partial v}$
24. Find the area between the curves $x + y^2 = 0$ and $x + 3y^2 = 2$
25. Find the surface area of the cone generated by revolving the line segment $y = \frac{x}{2}$, $0 \le x \le 4$ about the x-axis
26. Find the area of the cardiod $r = a(1 + \cos\theta)$
27. Evaluate $\int_0^{2\pi}\int_0^{\pi}\int_o^{\frac{1-\cos\varphi}{2}} \rho^2 \sin\varphi \, d\rho \, d\varphi \, d\theta$

(5 x 5 = 25)

PART - D

Answer **any 2** questions. Each question carries 12 marks

28. a) If $y=e^{\tan^{-1} x}$, prove that $(1+x^2)\, y_{n+1} + 2n(x-1)\, y_n + m(n-1)y_{n-1}=0$
    b) Find the asymptotes of $y^3-6xy^2+11x^2y-6x^3+x+y=0$
29. Find the absolute maximum and minimum values of $f(x,y)= 2x^2-4x+y^2-4y+1$ on the closed region in the first quadrant bounded by $x=0, y=2, y=2x$
30. a) The region bounded by the curve $y = x^2$, the line $y = 2 - x$ and the y- axis for $x \ge 0$ is revolved about the y-axis to generate a solid.Find the volume of the solid using shell method
    b) Find the length of the curve $y = \frac{1}{3}(x^2 + 3)^{3/2}$ from $x=0$ to $x=3$
31. Evaluate $\int_0^3\int_0^4\int_{\frac{y}{2}}^{\frac{y}{2}+1}\left(\frac{2x-y}{2} + \frac{z}{3}\right)dx\,dy\,dz$ by applying the transformation $u = \frac{2x-y}{2}$, $v = \frac{y}{2}$, $w = \frac{z}{3}$ and integrating over an appropriate region in uvw-space

(12 x 2 = 24)

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