

**B. Sc. DEGREE END SEMESTER EXAMINATION - OCTOBER 2019****SEMESTER - 3: MATHEMATICS****(CORE COURSE FOR B. Sc. MATHEMATICS AND B. Sc. COMPUTER APPLICATIONS)****COURSE: 15U3CRMAT3-15U3CRCMT3, CALCULUS***(For Regular-2018 Admission and Supplementary / Improvement 2017, 2016, 2015, 2014 Admissions)*

Time: Three Hours

Max Marks: 75

**PART - A**Answer **all** questions. Each question carries 1 mark.

1. Find  $\frac{d^2y}{dx^2}$  if  $x=at^2$ ,  $y=2$  at
2. Check the concavity of the function  $y=\sin x$  over  $(0, \pi)$ .
3. How many asymptotes a closed curve has?
4. Define critical point of a function.
5. Find  $\frac{\partial f}{\partial y}$  for  $f(x,y)=e^{x+y+1}$
6. Evaluate  $\int_0^3 \sqrt{y+1} \, dy$
7. What is the area of the surface generated by revolving the smooth curve  $y=f(x)$  from  $x=c$  to  $x=d$ ?
8. Write the shell formula for finding the volume of the solid generated by revolving a region about the  $y$ -axis.
9. What is the area of a closed bounded region  $R$  in polar co-ordinates?
10. Write the co-ordinate conversion formula from spherical to rectangular co-ordinates.

(1 x 10 = 10)

**PART - B**Answer **any 8** questions. Each question carries 2 marks.

11. Find the  $n$ th derivative of  $\cos(ax+b)$
12. Find the points of inflections of the curve  $y=(\log x)^3$
13. Find  $f_x$  and  $f_y$  of  $f(x,y)=x^2+3xy+y-1$  at  $(4,-5)$
14. Draw a tree diagram for  $\frac{dz}{dt}$  for  $z=f(x,y)$ ;  $x=g(t)$ ,  $y=h(t)$
15. Find the local extreme values of  $f(x,y)=x^2+y^2$
16. Find the area of the region enclosed by the co-ordinate axes and the line  $x+y=2$
17. Find the volume of the solid generated by revolving the region bounded by  $y=\sqrt{x}$ ,  $0 \leq x \leq 4$  and the  $x$ -axis about the  $x$ -axis
18. Change to polar integral and evaluate  $\int_0^1 \int_0^{\sqrt{1-y^2}} (x^2 + y^2) dx dy$
19. Find the Jacobian of the transformation  $x=u \cos v$ ,  $y=u \sin v$
20. Evaluate  $\int_0^1 \int_0^{1-y} \int_0^2 dx dz dy$

(2 x 8 = 16)

**PART - C**

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

21. Expand  $\log(1+x)$  in ascending powers of  $x$
22. Find the radius of curvature of the curve  $\sqrt{x} + \sqrt{y} = \sqrt{a}$  at the point  $(\frac{a}{4}, \frac{a}{4})$
23. Find  $\frac{\partial w}{\partial r}$  and  $\frac{\partial w}{\partial s}$  in terms of  $r$  and  $s$  if  $w = x^2 + y^2$ ;  $x = r - s$ ,  $y = r + s$  using chain rule
24. Find the area between the curves  $x + y^2 = 0$  and  $x + 3y^2 = 2$
25. Find the length of the curve  $y = (x/2)^{2/3}$  from  $x=0$  to  $x=3$
26. Evaluate the integral  $\int_0^{2\sqrt{\ln 3}} \int_{\frac{y}{2}}^{\sqrt{\ln 3}} e^{x^2} dx dy$  by reversing the order of integration.
27. Evaluate the cylindrical co-ordinate integral  $\int_0^{2\pi} \int_0^{2\pi} \int_0^{3+24r^2} dz r dr d\theta$

(5 x 5 = 25)

**PART - D**

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

28. a) If  $y = (\sin^{-1} x)^2$ , show that  $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - n^2y_n = 0$   
 b) Find the evolute of the parabola  $y^2 = 4ax$
29. a) Find  $\frac{dw}{dt}$ , given  $w = z - \sin xy$ ;  $x = t$ ,  $y = \log t$ ,  $z = e^{t-1}$   
 b) Find the maximum and minimum values of the function  $f(x,y) = 3x + 4y$  on the circle  $x^2 + y^2 = 1$
30. a) 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  $x = 3$   
 b) Find the area of the surface generated by revolving the curve  $x = at^2$ ,  $y = 2at$ ,  $0 \leq t \leq 1$  about the  $x$ -axis
31. a) Find the volume of the solid bounded by the paraboloid  $z = x^2 + y^2$  and below by the triangle enclosed by the lines  $y = x$ ,  $x = 0$  and  $x + y = 2$  in the  $xy$  - plane  
 b) Find the volume of the ice cream cone  $D$  cut from the solid sphere  $\rho \leq 1$  by the cone  $\phi = \frac{\pi}{3}$

(12 x 2 = 24)

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