

END OF SEMESTER EXAMINATIONS, APRIL/MAY- 2019  
 CALCULUS  
 SUBJECT CODE: 08UAMA01

MAJOR : B.Sc.,(Mathematics)  
 TIME : 3 HOURS

SEMESTER : I  
 MAX.MARKS: 75

SECTION - A ( 5 X 2 = 10 )

Answer ALL Questions:

1. At which point on the curve  $y = x^3 - 12x + 18$  is the tangent parallel to the x-axis?  
 (OR)
2. Find the angle at which the radius vector cuts the curve  $\frac{1}{r} = 1 + e \cos \theta$ .
3. Find the asymptotes of  $(x+y)(x-y)(x-2y-4) = 3x+7y-6$ .  
 (OR)
4. Show that the curve  $(x^2 + y^2)^2 = a(3ax^2y - y^3)$  has a triple point at the origin and that the angles between the branches through the origin are equal.
5. Find  $\int \sin^4 x \cos^3 x dx$ .  
 (OR)
6. Evaluate  $\int_0^\infty \frac{1}{\sqrt{\log\left(\frac{1}{x}\right)}} dx$ .
7. Evaluate  $\iint_{1,1}^{2,3} xy^2 dx dy$ .  
 (OR)
8. Show that  $\iint_{0,0}^{\pi,\pi} f(x,y) dx dy = \iint_{0,x}^{\pi,\pi} f(x,y) dx dy$ .
9. If  $f(x) = x - x^2$ ,  $-\pi < x < \pi$ , find Euler constant  $a_o$ .  
 (OR)
10. If  $f(x) = x \sin x$ ,  $-\pi < x < \pi$  find the Euler constant  $a_o$ .

SECTION - B ( 5 X 4 = 20 )

Answer ALL Questions:

11. Find the equation of the tangent to the ellipse  $x^2/a^2 + y^2/b^2 = 1$  at  $(x_1, y_1)$ .  
 (OR)
12. Find the envelope of the family of straight lines  $y + xt = 2at + at^2$ , the parameter being  $t$ .
13. Show that the asymptotes of the cubic  $x^3y - xy^2 + xy + y^2 + x - y = 0$  cut the curve again the three points which lie on the line  $x + y = 0$ .  
 (OR)
14. Show that the curve  $y^2 = 2x^3y + x^4y + x^4$  has a double cusp at the origin.

15. Evaluate  $\int_0^{\pi} \frac{\tan^{-1}}{1+x^2} dx.$

(OR)

16. Evaluate  $\int_0^x \sin^{10} \theta d\theta$  using Gamma function.

17. Evaluate  $\iint_{0,0}^{a,b} xy(x+y) dx dy.$

(OR)

18. Evaluate  $\iiint_{0,0,0}^{a,b,c} (x+y+z) dx dy dz.$

19. If  $f(x) = \begin{cases} -x & ; -\pi < x < 0 \\ x & ; 0 \leq x < \pi \end{cases}$  expand  $f(x)$  as Fourier Series in  $(-\pi, \pi).$

(OR)

20. Find sine series for  $f(x) = c \sin(0, \pi).$

**SECTION - C ( 5 X 9 = 45 )****Answer ALL Questions:**

21. Find the condition that the curves  $ax^2 + by^2 = 1$  and  $a_1x^2 + b_1y^2 = 1$  such cut orthogonally.  
(OR)

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

23. Find the asymptotes of  $(x-y)^2(x-2y)(x-3y) - 2a(x^3 - y^3) - 2a^2(x+y)(x-2y) = 0.$   
(OR)

24. Trace the curve  $x^3 + y^3 = 3axy.$

25. Evaluate  $\int x^3 (\log x)^4 dx$  using the reduction formula for  $\int x^n (\log x)^m dx.$   
(OR)

26. Show that  $\beta(m, \frac{1}{2}) = 2^{2m-1} \beta(m, n).$  <http://www.tnstudy.com>

27. Evaluate  $\int_0^{\log a} \int_0^v \int_0^{x+v} e^{x+y+z} dx dy dz.$   
(OR)

28. Evaluate  $\iint xy dx dy$  once the positive quadrant of the circle  $x^2 + y^2 = a^2.$

29. Find Fourier series of  $f(x) = e^{ix}$  in  $(0, 2\pi).$

(OR)

30. Find a Fourier Series with period 3 to represent  $f(x) = 2x - x^2$  in the range  $(0, 3).$

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