R-19

Code:1308/BL

Faculty of Science

B. Sc (Mathematics) I-Year, CBCS –I Semester Backlog Examinations, January 2021

PAPER: DIFFERENTIAL AND INTEGRAL CALCULUS

Time: 2 Hours　　　　　　　　　　　　　　　　　　　　　　　Max Marks: 80

I. Answer Any FOUR from the following questions　　　　　　　　　(4x20=80 Marks)

1. If $4 = sim^{-1}\frac{x^2+y^2}{x+y}, S/T\ x\frac{\partial u}{\partial x} + y\frac{\partial v}{\partial y} = tan4$
2. If $4 = log\,(x^3 + y^3 + z^3 - 3xyz)$, then S/P $(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z})^2\ 4 = \frac{-9}{(x+y+z)^2}$
3. Find maximum value of $f(x, y, z) = x^a y^b z^c$ subject to the condition $x + y + z = 1$, where a, b, c are positive integers.
4. Expand the function $f(x, y) = x^2 + xy - y^2$ by tan cos threesome in powered of $(x - 1)\ and\ (y + 2)$
5. If a curve is defined by the equation $x = f(t)$ and $y = \emptyset(t), then\ P/T\ \ p = \frac{(x^{1^2} + y^{1^2})^{3/2}}{x^1 y^{11} - 4^1 x^{11}}$ where denote differentiation w,r+t.
6. For a cycloid $x = a(t + sint), y = (1 - cost), prove\ that\ e = 4a\ cos\ (\frac{1}{2}t)$
7. Find the volume of the solid obtained by revolving the log of the curve $a^2y^2 = x^2(2a - x)(x - a)$ about 'x' a is.
8. S/T the length of the curve $x^2 = a^2(1 - e^{y/a})$ measured from $0(0,0)\ to\ p(x, y)\ is\ alog\ \left(\frac{a+x}{a-x}\right) - x$

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Faculty of Science

B. Sc (Mathematics) I-Year, CBCS –I Semester

Backlog Examinations -June/July, 2022

PAPER: Differential and Integral Calculus

Time: 3 Hours Max Marks: 80

Section-A

I. Answer any *eight* from the following (8x4=32 Marks)

1. If $u = x^2 \tan^{-1}\frac{y}{x} - y^2 \tan^{-1}\frac{x}{y}, xy \neq 0, p/t\ \frac{\partial^2 u}{\partial x \partial y} = \frac{x^2-y^2}{x^2+y^2}$
2. Find second order partial derivatives of e^{x-y}
3. Verify Evler's their some for $z = (x^2 + xy + y^2)^{-1}$
4. If $H = f(y-z, z-x, x-y),\ p/t\ \frac{\partial H}{\partial x} + \frac{\partial H}{\partial y} + \frac{\partial H}{\partial z} = 0$
5. Find the maximum & minimum values of the function $f(x) = 8x^5 - 15x^4 + 10x^3$
6. If $z = x^2 + y^2,\ x = at^2\ and\ y = 2at,$ then evaluate $\frac{dz}{dt}$
7. Find the envelope of the straight lines $x \cos \propto + y \sin \propto = l \sin \propto \cos \propto,\ \propto$ being the parameter.
8. Find the radium of curvature at the organ of the curve $x^3 - 2x^2y + 3xy^2 - 4y^3 + 5x^2 - 6xy + 7y^2 - 8y = 0$
9. Find the envelope of the family of curve $y = mx + am^3$
10. Find the length of the area of the curve $y = \log secx$ from $x = 0\ to\ x = \pi/3$
11. Find the perimeter of the cardioids $r = a\,(1 - cos\theta)$
12. Find the length of the curve $y = x^{3/2}\ from\ x = 0\ to\ x = 4$

Section-B

II. Answer the following questions (4x12=48 Marks)

13. (a) If $z = f(x, y)$ is a homogenous function of x, y of degree n, then p/t
$x\frac{\partial^2 u^2}{\partial x^2} + 2xy\frac{\partial^2 v}{\partial x \partial y} + y\frac{\partial^2 u}{\partial y^2} = n(n-1)z$

(OR)

(b) If $u = log\,(x^2 + y^3 + z^3 -)xyz,$ then s/t $(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z})^2 u = \frac{-9}{(x+y+z)^2}$

14. (a) Expand the function $f(x, y) = x^2 + xy - y^2$ by Taytors their some in powered of $(x-1) and (y+2)$

(OR)

(b) In a plane tangle, find the maximum value of $u = \cos A \cos B \cos C$ where A, B, C are the angles of the angle.

15. (a) For a cycloid $x = a(t + sint), y = (1cost), p/t\ e = 4a \cos(\frac{1}{2}t)$

(OR)

(b) Find the evolutes of the hyperbola $2xy = a^2$

16. (a) Find the volume of the solid obtained by revolting one are of the cycloid $x = a(0 + sin\theta), y = a(1 + cos\theta)$

(OR)

(b) Find the volume of the solid obtained by revolting the loop of the curve $a^2y^2 = x^2(2a - x)(x - a)$ about $x -$ is.

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Faculty of Science

B.Sc (Mathematics)I-Year, CBCS–I Semester Backlog Examinations –June, 2023

PAPER: Differential and Integral Calculus

Time: 3 Hours Max Marks: 80

Section-A

I. Answer any *eight* of the following questions (8x4=32 Marks)

1. If $u = Sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = tanu$
2. $z = tan^{-1}\left(\frac{x^2+y^2}{x+y}\right)$ then find $\frac{\partial z}{\partial x}, \frac{\partial z}{\partial y}$
3. Show that $lim_{(x,y)\to(0,0)}\frac{xy}{x^2+y^2}$ does not exist.
4. If $H = f(y-z, z-x, x-y)$ prove that $\frac{\partial H}{\partial x} + \frac{\partial H}{\partial y} + \frac{\partial H}{\partial z} = 0$
5. If $u = x^2 - y^2, x = 2r - 3s + 4, y = -r + 8s - 5$ find $\frac{\partial u}{\partial r}$
6. Find the radius of curvature of $y = 4sinx - sin2x$ at $P = \left(\frac{\pi}{2}, 4\right)$
7. Find the radius of curvature of $y = xe^{-x}$ at its maximum point.
8. By Newton's method find the radius of curvature of $y = x^4 - 4x^3 - 18x^2$ at $(0,0)$
9. Find radius of curvature of $s = 4aSin\frac{\psi}{3}$ at $P = \left(\frac{\pi}{2}, 2a\right)$
10. Find the length of the of the arc of the curve $y = \log sec\, x$ from $x = 0$ to $x = \frac{\pi}{3}$
11. Find the length of the arc of the curve $x = a(\theta + sin\,\theta),\ y = a(1 - cos\theta)$ from $\theta = 0\ to\ \theta = \pi$
12. Find the perimeter of the cardioide $r = a(1 - cos\theta)$ from $\theta = 0\ to\ \theta = \pi$

Section-B

II. Answer the following questions (4x12=48 Marks)

13. (a) (i) State and Prove Euler's theorem for Homogeneous functions.

    (ii) If $x^y = y^x$ then find $\frac{\partial y}{\partial x}$

    (OR)

    (b) If $f(x,y) = \begin{cases} \frac{x^3y}{x^2+y^2}, & x^2+y^2 \neq 0 \\ 0, & (x,y) = (0,0) \end{cases}$ then show that $f_{yx}(0,0) \neq f_{xy}(0,0)$

14. (a) If $z = e^u f(v), u = ax + by, v = ax - by,$ then show that $b\frac{\partial z}{\partial x} + a\frac{\partial z}{\partial y} = 2abz$

    (OR)

    (b) Expand $e^x\log(1+y)$ in powers of $x\ and\ y$

15. (a) Find the centre and circle of curvature at the point $P\left(\frac{a}{4}, \frac{a}{4}\right)$ on $\sqrt{x} + \sqrt{y} = \sqrt{a}$

    (OR)

    (b) Find the evolute of the hyperbola $2xy = a^2$

16. (a) Prove that the loop of the curve $x = t^2,\ y = t - \frac{t^3}{3}$ is of length $4\sqrt{3}$

    (OR)

    (b) Find the volume of the solid obtained by revolving the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about the $x - axis.$

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