

B. Sc. DEGREE END SEMESTER EXAMINATION - OCTOBER 2019
SEMESTER - 1: COMPLEMENTARY FOR BSC PHYSICS / BSC CHEMISTRY
COURSE –19U1CPMAT1: CALCULUS - 1
(For Regular - 2019 Admission)

Time: Three Hours

Max Marks: 75

PART - AAnswer **any 10** questions. Each question carries 2 marks.

1. State Mean Value Theorem.
2. Find the absolute extrema of $f(x) = x^2$ on $[-2,1]$.
3. Find the function $f(x)$ whose derivative is 'sin x ' and whose graph passes through the point $[0,2]$.
4. Find the first order partial derivatives of f , when $f(x,y) = x \tan^{-1}(xy)$.
5. Show that $z = \ln \sqrt{x^2 + y^2}$ satisfy the Laplace equation.
6. Find the greatest and smallest values that the function $f(x,y) = xy$ takes on the ellipse

$$\frac{x^2}{8} + \frac{y^2}{2} = 1$$
7. Find the Volume of the solid obtained by rotating the region bounded by $y = x^3, y = 8, x = 0$ about y-axis
8. Find the length of the asteroid $x = \cos^3 t, y = \sin^3 t, 0 \leq t \leq 2\pi$
9. Find the area of the surface swept out by revolving the circle $x^2 + y^2 = 1$ about the x-axis.
10. Evaluate $\int_0^1 \int_0^{1-y} \int_0^2 dx dz dy$.
11. Write the Jacobian determinant of $x = g(u,v), y = h(u,v)$.
12. Find the average value of $f(x,y) = x(\cos xy)$ over the rectangle $0 \leq x \leq \pi$ and $0 \leq y \leq 1$.

(2 x 10 = 20)

PART - BAnswer any **five** questions. Each question carries 5 marks

13. Does the function $f(x) = \sqrt{x(1-x)}$ on $[0, 1]$ satisfy the hypothesis of mean value theorem?
14. Show that $y = \tan x$ is increasing in every interval in its domain.
15. Find all local maxima, local minima and saddle point of $f(x,y) = x^3 + y^3 - 3x - 12y + 20$
16. The plane $x + y + z = 1$ cuts the cylinder $x^2 + y^2 = 1$ in an ellipse. Find the points on the ellipse that lie closest to and farthest from the origin.
17. Find the area of the region enclosed by $x + y^2 = 0$ and $x + 3y^2 = 2$.
18. The region bounded by $y = x^2, y = 2-x, x = 0$ for $x \geq 0$ revolves about y axis. Find the volume of the solid generated by shell method.

19. Find the area of the region cut from the first quadrant by the cardioid $r = 1 + \sin \theta$
20. Evaluate the integral by changing the Cartesian integrals to polar integrals

$$\int_{-1}^1 \int_{-\sqrt{1-y^2}}^{\sqrt{1-y^2}} (x^2 + y^2) dx dy$$

(5 x 5 = 25)

PART - C

Answer any **three** questions. Each question carries 10 marks.

- 21.
- (a) Find the critical point of $f(x) = x^3 - 12x - 15$. Identify the intervals on which f is increasing and decreasing.
- (b) Show that the function $h(\theta) = 3 \cos \frac{\theta}{2}$, $0 \leq \theta \leq 2\pi$ at $\theta = 0$ and $\theta = 2\pi$ have local extreme values at the given values of θ and say which kind of local extreme the function has.
22. 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 $x = 0$, $y = 0$, $y = 9 - x$.
23. Find the volume of the solid generated by revolving the triangle with vertices $(1,1)$, $(1,2)$, $(2,2)$ about
- (i) the line $x = 10/3$.
- (ii) the line $y = 1$
24. Find the volume of the region enclosed by the surfaces $z = x^2 + 3y^2$ and $z = 8 - x^2 - y^2$
- (10 x 3 = 30)
