QP CODE: 19102120

19102120

Reg No : .....

Name : .....

B.Sc. DEGREE (CBCS) EXAMINATION, OCTOBER 2019

Third Semester

CORE COURSE - MM3CRT01 - CALCULUS

(Common to B.Sc Computer Applications Model III Triple Main, B.Sc Mathematics Model I, B.Sc Mathematics Model II Computer Science)

2017 Admission Onwards

24282AFB

Maximum Marks: 80 Time: 3 Hours

Part A

Answer any ten questions

Each question carries 2 marks.

1. Expand a^x by Maclaurin's series.
2. Write the co-ordinates of the centre of curvature of a curve $y = f(x)$ at a point $P(x, y)$
3. what is an oblique asymptotes.
4. Find the envelope of family of straight line y = mx+ a/m, m being the parameter.
5. Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ if $f(x, y) = y^x$
6. Find $\frac{dw}{dt}$ if $w = x^2 + y^2$, $x = \cos t$, $y = \sin t$.
7. Explain the absolute maximum of a continuous function at a point (a, b) defined on a bounded region R.
8. The solid lies between planes perpendicular to the X-axis at x=0 and x=4 . The cross-sections perpendicular to X-axis are squares whose diagonals run from the parabola $y = -\sqrt{x}$ to the parabola $y = \sqrt{x}$. Find the area of cross section $A(x)$.
9. Find the volume of solid of revolution generated by rotating the region between the Y-axis and graph of the function $y = x$; $0 \le y \le 1$ about Y-axis.
10. Write the equations for finding surface area of revolution about (i) the X-axis (ii) the Y-axis.
11. Evaluate $\int\int_R (10 + x^2 + 3y^2)\, dA$ where $R: 0 \le x \le 1; 0 \le y \le 2$
12. Evaluate $\int_0^2 \int_0^2 \int_0^2 dz\, dy\, dx$.

(10×2=20)

Part B

Answer any six questions.

Each question carries 5 marks.

13. Obtain Taylor series expansion in powers of h for $f(x) = \cos(x + h)$

14. Find the radius of curvature of $\frac{x^2}{9} + \frac{y^2}{16} = 2$ at (3,4).

15. Verify that $w_{xy} = w_{yx}$ where $w = x^2 \tan(xy)$.

16. Find all local extreme values and saddle point, if any, of the function $f(x, y) = x^3 - y^3 - 2xy + 6$.

17. Find the volume of the solid generated by revolving the region bounded by the curves and lines $y = x^2$, $y = 2 - x$, $x = 0$ for x \geq 0 about the Y-axis using shell method.

18. Find the length of the curve $y = \int_0^x \tan t \, dt$, $0 \leq x \leq \pi/6$

19. Sketch the region of integration and calculate $\int\int_R \frac{\sin x}{x} \, dA$ where R is the triangle in the XY-plane bounded by the X-axis and the line $y = x$ and

20. Sketch the region bounded by the lines $x = 0$, $y = 2x$ and $y = 4$. Express the region's area as double integral and evaluate the integral.

21. Evaluate the cylindrical coordinate integral $\int_0^{2\pi} \int_0^3 \int_{r^2/3}^{\sqrt{18-r^2}} dz \, r \, dr \, d\theta$

(6×5=30)

Part C

Answer any two questions.

Each question carries 15 marks.

22. Find the ranges of values x in which the curve $y = 3x^3 - 40x^2 + 3x - 20$ are conve upwards or downwards. Also find their pointsof inflection , equation of the inflectional tangents to the curve and show that they lie on a straight line.

23. (a). If $\sin u = \frac{x + y}{\sqrt{x} + \sqrt{y}}$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$.

(b). Find the maximum and minimum values that the function $f(x, y) = 3x + 4y$ takes on the circle $x^2 + y^2 = 1$

24. (a). Find the volume of the solid that results when the region enclosed by $y = \sqrt{x}$, $y = 0$ and $x = 9$ revolved about the line $x = 9$.

(b) Find the length of the curve $x = \frac{1}{3}(y^2 + 2)^{3/2}$ from $y = 0$ to $y = 1$.

(c). Find the area of the surface generated by revolving the curve $y = \sqrt{x} - \frac{1}{3}x^{3/2}$; $1 \leq x \leq 3$, about the X-axis.

25. (a). Evaluate $\iint_R e^{x^2+y^2} \, dA$ where R is the semi circular region bounded by the X-axis and the curve $y = \sqrt{1 - x^2}$.

(b). Find the Jacobian $\frac{\partial(x, y, z)}{\partial(u, v, w)}$ for the transformation

$u = x + y + z$, $v = x + y - z$, $w = x - y + z$.

(2×15=30)