QP CODE: 19102120

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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 $y = x$; $0 \leq y \leq 1$ 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 $R:\ 0 \leq x \leq 1;\ 0 \leq y \leq 2$
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 $y=\int_0^x \tan t\,dt,\ 0\le x\le \pi/6$

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 $y=4$. Then 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 $x=9$ is 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 $y=\sqrt{x}-\frac{1}{3}x^{3/2}$; $1\le x\le 3$, 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)