QP CODE: 18103422

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Reg No : .....

Name : .....

B.Sc. DEGREE (CBCS) EXAMINATION, NOVEMBER 2018

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

EFAC7AEC

Maximum Marks: 80 **Time: 3 Hours**

Part A

Answer any **ten** questions.

Each question carries **2** marks.

1. Expand $2x^3 + 7x^2 + x - 6$ in powers of (x-2), using Taylor,s series.
2. Define evolute of a curve.
3. Find the asymptotes parallel to the co-ordinate axes of the curve $x^2 y^2 = x^2 - a^2 y^2$.
4. Define envelope of one parameter family of curves.
5. State Mixed derivative theorem in the second order partial derivatives.
6. Define critical point of a two variable function with an example.
7. Explain the absolute minimum of a continuous function at a point (a, b) defined on a bounded region R.
8. *Explain Cavalieri's Principle.*
9. Define solid of revolution. Give an example.
10. Give an example for a solid of revolution whose cross section is a washer.
11. Calculate $\int\int_R f(x,y)dA$ where $f(x,y) = 1 - 6x^2y$ and $R: 0 \le x \le 2; -1 \le y \le 1$..
12. Find the Jacobian $\frac{\partial(x,y)}{\partial(u,v)}$ for the transformation $x = u\sin v,\ y = u\cos v$.

(10×2=20)

Part B

Answer any **six** questions.

Each question carries **5** marks.

13. Find the points of inflecion on the curve $y = (\log x)^3$.
14. Show that the equation of the circle of curvature at the origin of the parabola $y = mx + x^2$ is $x^2 + y^2 = (1 + m^2)(y - mx)$.

15. If $z = \ln \sqrt{x^2 + y^2}$, prove that $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$

16. Evaluate $\frac{dw}{dt}$ at $t = 1$ if $w = \ln(x^2 + y^2 + z^2)$, $x = \cos t$, $y = \sin t$, $z = 4\sqrt{t}$

17. Find the length of the curve $y = \int_0^x \sqrt{\cos 2t}\ dt$, from $x = 0$ to $\pi/4$.

18. Find the area of the surface that is generated by revolving the portion of the curve $y = \tan x$; $0 \le x \le \pi/4$ about the X-axis.

19. Sketch the region of integration, reverse the order of integration and evaluate the integral $\int_0^1 \int_y^1 x^2 e^{xy}\ dx\ dy$

20. Find the average value of $f(x, y) = \frac{1}{xy}$ over the square $\ln 2 \le x \le 2 \ln$; $\ln 2 \le y \le 2 \ln$.

21. Evaluate the cylindrical coordinate integral $\int_0^{2\pi} \int_0^1 \int_r^{\sqrt{2-r^2}} dz\, r\, dr\, d\theta$

(6×5=30)

Part C

Answer any **two** questions.

Each question carries **15** marks.

22. Expand $\sin(m \sin^{-1} x)$ in ascending powers of x. Hence or otherwise expand $\sin m\theta$ in powers of $\sin \theta$

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 generated by revolving the region bounded by the curves $y = \sin x$ and $y = \cos x$ from $x = 0$ to $x = \pi/4$ about X-axis.

(b). Using Shell method, find the volume of the solid generated by revolving the regions bounded by the curve $y = x^2$, the line $y = 2 - x$, X-axis and for $x \ge 0$ about the Y-axis.

25. Evaluate $\iiint_D |xyz|\ dV$ where D is the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$

(2×15=30)