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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

EFACTAEC

Maximum Marks: 80

Time: 3 Hours

Part A

Answer any ten questions.

Each question carries 2 marks.

- Expand $2x^3 + 7x^2 + x 6$ in powers of (x-2), using Taylor, series.
- 2. Define evolute of a curve.
- 3. Find the asymptotes parallel to the co-ordinate axes of the curve $x^2y^2 = x^2 a^2y^2$.
- 4. Define envelope of one parameter family of curves.
- 5. State Mixed derivative theorem in the second order partial derivatives.
- 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.
- Explain Cavalieri's Principle.
- 9. Define solid of revolution. Give an example.
- 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 $R: 0 \le x \le 2; -1 \le y \le 1.$
- Find the Jacobian $\dfrac{\partial(x,y)}{\partial(u,v)}$ for the transformation $x=u\sin v,\ y=u\cos v$.

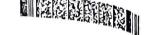
 $(10 \times 2 = 20)$

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 z = 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 χ .
- 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 $f(x,y)=rac{1}{xy}$ 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 $x\geq 0$ 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