DIFFERENTIAL AND INTEGRAL CALCULUS

MINOR 1 PRACTICE QUESTIONS

1. Explain in detail about Geometrical interpretation of Rolle's Theorem.
2. State Geometrical interpretation of Lagrange's theorem
3. Verify Rolle's theorem for $x(x+3)e^{-x/2}$ in [-3, 0]
4. State Rolle's Theorem and S.T. $g(x)=8x^3-6x^2-2x+1$ has a zero between 0 and 1.
5. Prove that $\frac{\pi}{4}+\frac{3}{25}<\tan^{-1}\frac{4}{3}<\frac{\pi}{4}+\frac{1}{6}$ using Lagrange's Mean Value Theorem.
6. Prove that using mean value theorem $x>\log(1+x)>\frac{x}{1+x},\ if\ x>0$
7. State Cauchy's Mean Value theorem.
8. Show that $\log(1+e^x)=\log 2+\frac{x}{2}+\frac{x^2}{8}+\frac{x^4}{192}+------$
9. Verify Cauchy's Mean value theorem for $f(x)=\sqrt{x}, g(x)=\frac{1}{\sqrt{x}}$ in [a,b]
10. If $u=x+y+z, uv=y+z, uvw=z\ then$ show that $JJ'=1$
11. If $u=x^2-y^2, v=2xy\ where\ x=r\cos\theta, y=r\sin\theta$ then find $J\left(\frac{u,v}{r,\theta}\right)$
12. If $x=r\cos\theta\ \ and\ \ y=r\sin\theta\ \ then$ show that $JJ^1=1$
13. Check whether the following functions are functionally dependent or not if so find the relation between them where $u=\frac{x^2-y^2}{x^2+y^2}, v=\frac{2xy}{x^2+y^2}$
14. Divide 24 into three parts such that the continued product of the first, square of the second and cube of the third is maximum.
15. A rectangular box open at the top is to have volume of 32 cubic feet, Find the dimensions of the box requiring least material for its construction.
16. Find the extreme values of $f(x,y)=\sin x+\sin y+\sin(x+y)$
17. Find the volume of the largest rectangular parallelepiped that can be inscribed in the ellipsoid $4x^2+4y^2+9z^2=36$.
18. Evaluate $\int_1^3\int_{-x+2}^{x}(2x+1)\,dydx$ by changing order of integration.

19. Evaluate $\iint_R xy\,dx\,dy$ where R is the region bounded by x-axis, $x = 2a$ and the curve $x^2 = 4ay$

20. Evaluate $\iint_R (x+y)\,dy\,dx$ where the region is bounded by xy=6 and x+y=7

21. Evaluate $\int_0^4 \int_0^{x^2} e^{\frac{y}{x}}\, dy\, dx$

22. Evaluate $\iint_R (x^2+y^2)\,dx\,dy$ over the area bounded by the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$

23. Change the order of integration and Evaluate $\int_0^1 \int_y^{2-y} xy\,dx\,dy$

24. Change the order of integration and Evaluate $\int_0^1 \int_{x^2}^{2-x} xy\,dy\,dx$

25. Change the order of integration and Evaluate $\int_0^a \int_y^a \frac{x}{x^2+y^2}\,dx\,dy$