Bachelor Level / first-semester / Science Full marks: 80 **Computer Science and Information Technology(MTH112)** Pass marks: 32 (Mathematics I (Calculus)) Time: 3 hours Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.

Attempt all questions.

Group A (10×2=20)

1. If f(x) = x + 2 and g(x) = x^3 − 3 find g(f(3)).

2. Show that the area under the arch of the curve y = sin x is.

3. Test the convergence of the series $\lim\limits_{n\to\infty} \dfrac{a-bn^3}{n^3-c}$.

4. Find the equation of the parabola with vertex at the origin and focus at (0,2).

5. Find the angle between the planes 3x − 6y − 2z = 7 and 2x + y − 2z = 5

6. Evaluate $\int_1^2 \int_y^{y^2} dx\,dy$.

7. Find and if f(x, y) = 10 − x^2 − y^2.

8. Prove that $u_{xy} = u_{xy}$ is $u = 1\,n(2x + 3y)$

9. Show that $y = \dfrac{1}{2}e^x + be^{-x}$ of $\dfrac{dy}{dx} + y = e^x$

10.Solve $\dfrac{d^2 y}{dx^2} + w^2 y = 0.$

Group B (5×4=20)

11. Verify Rolles's theorem for the function f(x) = x^2 − 5x + 7 in the interval [2,3].

12. Find the Taylor's series expansion of f(x) = sin x at x = 0.

13. Obtain the polar equations for circles through the origin centered on the x and y axis ,with radius a.

14. Evaluate $\underset{(x,y)\to(0,0)}{Lt} \dfrac{2y^2}{x^2+xy}$.

15. Obtain the general solution of $(y - z)\dfrac{dz}{dx} + (x - y)\dfrac{dz}{dy} = z - x$

Group C (5×8=40)

16. State Lagranhes's mean value theorem and verify the theorem for $x = x^3 - x^2 - 5x + 3$ in $[0,4]$.

Or

$$(a). \int_{-\infty}^{\infty} \frac{dx}{1+x^2} \qquad (b) \int_0^3 \frac{dx}{(x-1)^{\frac{2}{3}}}$$

Investigates the convergence of the integrals   17. Define curvature of a curve .Show that the curvature of a (a) straight line on zero and (b) a circle of a radius a is l/a .

18.Find the volume enclosed between the surfaces $Z = x^2 + 3y^2$ and $Z = 8 - x^2 - y^2$

19. Find the maximum and minimum of the function $f(x, y) = x^3 + y^3 - 12x + 20$.

OR

Find the Point on the ellipse $x^2 + 2y^2 = 1$ where $f(x, y) = xy$ has its extreme values.

20. Define second order partial differential equation .What is initial boundary values problem ?Solve : $u_t = u_{xx} = u_{tt} = u_{xx}$