Tribhuwan University
Institute of Science and Technology
2069

Bachelor Level / First Semester / Science — Full marks: 80
Computer Science and Information Technology(MTH112) — Pass marks: 32
((TU CSIT) 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. Verify the men value theorem for the function f(x) = √x(x – 1) in the interval [0, 1].

2. Find the length of the curve $y = \frac{4\sqrt{2}}{3}x^{3/2} - 1$ **for 0 ≤ x ≤ 1.**

3. Test the convergence of the series $\sum_{n=1}^{\infty} \frac{1}{}$ **By comparison test.**

4. Obtain the semi-major axis ,semi-minor axis,foci,vertices $\frac{x^2}{} + \frac{y^2}{} = 1$

5. Find the angle between the vectors 2i+j+k and -4i+3j+k.

6. Obtain the area of the region R bounded by y=x and y= x^2 in the first quadratic .

7. Show that the function $f(x,y) = \begin{cases} \frac{2xy}{x^2+y^2} & (x,y) \neq (0,0) \end{cases}$ **Is continuous at every point in the plane except the origin.**

8. Using partial derivatives ,find $\frac{dy}{}$ **if 2xy + tany – $4y^2$ = 0.**

9. Verify that the partial differential equation $\frac{d^2Z}{} - \frac{d^2Z}{} = \frac{2z}{}$ **is satisfied by** $z = \frac{1}{}\phi(y-x) + \phi'(y-x)$ **.**

10.Find the general solution of the equation $x^2\frac{dz}{} + \frac{y^2dz}{} = (x+y)z$

Group B (5×4=20)

11. State and prove mean value theorem for definite integral.

12. Find the area of the region that lies in the plane enclosed by the cardioid r = 2(i + cosθ).

13. What do you mean by principle unit normal vector? Find unit tangent vector and principle unit vector for the circular motion $\vec{r}(t) = (cos2t)i + (sin2t)j.$

14. Define partial derivative of a function f(x,y) with respect to x at the point (x_0y_0).State Euler's theorem ,verify if it for the function .f(x, y) = x^2 + 5xy + sinx + $7e^x$, $x = \left(\frac{y}{\quad}\right)+1$

15. Find the particular integral of the equation $\frac{d^2z}{\quad} - \frac{dz}{\quad} = 2v - x^2$

Group C (5×8=40)

16. Graph the function $\frac{1}{\quad}$ $\frac{2}{\quad}$

17. What is mean by maclaurin series? Obtain the maclaurin series for the function $f(x) = e^{-x}$

18.Evaluate the double integral $\int_{\quad}^{4} \int_{y}^{x=\frac{y}{2}+1} \frac{2x-y}{\quad} dxdy$ **by applying the transformation** $u = \frac{2x-y}{\quad}, v = \frac{y}{\quad}$ **and integrating over an appropriate region in the uv-plane.**

19. Define maximum and minimum of a function at a point .Final the local maximum and local minimum of the function f(x, y) = 2xy – $5x^2$ – $2y^2$ + 4x + 4y – 4.

20. Find the solution of the equation $\frac{d^2z}{\quad} - \frac{d^2z}{\quad} = x - y$

Or

Find the particular integral of the equation $(D^2 - D)z = 2y - x^2$ Where $D = \frac{d}{\quad}$ $D' = \frac{d}{\quad}$