Tribhuwan University
Institute of Science and Technology
2070

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. Define odd and even function, with example.

2. Show that the series $\sum_{n=1}^{\infty} \frac{(-1)^n 5}{4^n} = -\frac{5}{4} + \frac{5}{16} - \frac{5}{64} + \cdots \ldots$ **Converges to -1.**

3. Test the convergence of the series $\frac{(2n!)}{\ldots}$.

4. Find the eccentricity of the curve $2x^2 + y^2 = 4$.

5. Find the angle between the planes $3x - 6y - 2z = 15$ and $2x + y - 2z = 5$

6. Find the velocity and acceleration of a particle whose position is $\ldots(t+1)\vec{i} + (t^2 \ldots 1)\vec{j} \ldots$

7. Evaluate $\int^{2\pi}\int^{\pi}(\sin x + \cos y)\,dx\,dy$

8. Find the Jacobean j(u,v,w) if x=u+v, y=2 u,z=3w.

9. Show that $y = x^2 + 5$ is the solution of $\frac{dy}{\ldots} - 2x$

10.Find $\frac{df}{\ldots}$ **and** $\frac{df}{\ldots}$ **at (1,2) of $f(x, y) = x^2 + 2xy + 5$.**

Group B (5×4=20)

11. State Rolles's theorem and verify it for the functionf(x) = sinx in [0, π].

12. Find the Taylors series and the Taylor polynomials generated by $f(x) = e^x$ at x = 0.

13. Find the length of the cardioids $r = 1 + \cos\theta$.

14. Find the gradient vector of f(x,y) at a point$P(x_0, y_0)$.Find an equation for the tangent to the ellipse $x^2 + 4y^2 = 4$ at point (–2,1).

15. Find the general solution of $y^2 z \frac{dz}{\ldots} - x^2 z \frac{dz}{\ldots} = xy^2$

Group C (5×8=40)

16. Find the area of the region bounded by $x = 2y^2$. , $x = 0$ and $y = 3$.

Or

Investigates the convergence of the integrals (a) $\int^{\infty} \frac{dx}{}$ (b) $\int^{2} \frac{dx}{}$

17. Find the torsion ,normal and curvature for the space curve $\vec{r}(t) = (2\cos t)\vec{i} + (3\sin t)\vec{j} + t\vec{k}$

18.Evaluate $\int^{1} \int^{\sqrt{1-x^2}} dydx.$

19. Find the local maximum , minimum and saddles point of $6x^2 - 2x^3 + 3y^2 + 6xy$.

OR

Find the greatest and smallest values that the function f(x,y) =xy takes on the ellipse $\frac{x^2}{} - \frac{y^2}{} = 1.$

20. Define the wave equation by the modeling of vibrating string.