



K16U 2501

Reg. No. :

Name :

I Semester B.Sc. Degree (C.C.S.S. Reg./Supple./Improv.)

Examination, November 2016

COMPLEMENTARY COURSE IN MATHEMATICS

1C01 MAT-CH : Mathematics for Chemistry – I (2014 Admn. Onwards)

Time : 3 Hours

Total Marks : 40

SECTION – A

All the 4 questions are **compulsory**.

1. Find the derivative of $\log (\cosh x)$.
2. State Taylor's theorem.

3.
$$\lim_{(x, y) \rightarrow (0, 0)} \frac{e^{\sqrt{y}} \sin x}{x}$$

4. Represent the polar co-ordinate $(3, 2\pi/3)$ in polar graph. (4×1=4)

SECTION – B

Answer **any 7** questions.

5. Find $\frac{dy}{dx}$ if $x = y \log (xy)$.

6. If $x = \sin t$ and $y = \sin pt$, prove that $(1 - x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} + p^2y = 0$.

7. Find the Maclaurin's series of e^x .

8. Find c so that $f'(c) = \frac{f(b) - f(a)}{b - a}$ in $f(x) = \sin x$ $x \in [0, \pi]$.

9. Discuss the graph of $\sinh x$.

P.T.O.



$$10. \lim_{x \rightarrow a} \frac{\log(x-a)}{\log(e^x - e^a)}$$

$$11. \text{ If } U = x^2 \tan^{-1} \frac{y}{x} - y^2 \tan^{-1} \frac{x}{y}, \quad xy \neq 0 \text{ prove that } \frac{\partial^2 u}{\partial x \partial y} = \frac{x^2 - y^2}{x^2 + y^2}.$$

12. Find the first order partial derivatives of $e^{ax} \sin by$.

13. Find the Cartesian equation for the surface $z = r^2$ and identify the surface. (7×2=14)

SECTION - C

Answer any 4 questions.

14. Find $(x^2 e^x \cos x)_n$.

15. Using Taylor's series, expand $f(x) = \frac{1}{x-1}$ in powers of $x-2$.

16. Verify Rolle's theorem for the functions $f(x) = \frac{\sin x}{e^x}$ $x \in [0, \pi]$.

17. If $U = \sin^{-1} \frac{\sqrt{x} - \sqrt{y}}{\sqrt{x} + \sqrt{y}}$ show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 0$.

18. Find the curvature of the curve $x = a(t + \sin t)$, $y = a(1 - \cos t)$.

19. Replace the polar equation into Cartesian equation then describe the graph

a) $r \cos \theta + r \sin \theta = 1$

b) $r^2 = 1$.

(4×3=12)

SECTION - D

Answer any 2 questions.

20. Expand in $\sin x$ in powers of $(x-2)$.

$$21. \lim_{x \rightarrow 0} \left(\frac{1}{x^2} - \frac{1}{\sin^2 x} \right).$$

22. Find the evolute of the parabola $y^2 = 4ax$

23. Translate the equation $r = \operatorname{cosec} \theta$ into Cartesian and spherical coordinate system.

(2×5=10)