



K20U 3186

Reg. No. :

Name :

I Semester B.Sc. Degree (C.B.C.S.S. – Supplementary)
Examination, November 2020
(2014-2018 Admissions)

COMPLEMENTARY COURSE IN MATHEMATICS
1C01 MAT-CH : Mathematics for Chemistry – I

Time : 3 Hours

Max. Marks : 40

SECTION – A

All the first 4 questions are compulsory. They carry 1 mark each :

1. The derivative of a^x is _____ 1
2. State Rolle's theorem. 1
3. Define continuity in a domain. 1
4. To define polar co-ordinates we start with an origin called _____ 1

SECTION – B

Answer any seven questions from among the questions 5 to 13. These questions carry 2 marks each :

5. Find the derivative of $\operatorname{cosec} h^{-1}x$. 2
6. Differentiate $x^{\sin x}$. 2
7. Give the value of c so that $f'(c) = \frac{f(b) - f(a)}{b - a}$ where $f(x) = e^x$, $a = 0$, $b = 1$. 2
8. State Cauchy's mean value theorem. 2
9. Find $\frac{dz}{dt}$ when $z = xy^2 + x^2y$, $x = at^2$, $y = 2at$. 2
10. Give two important properties of evolute. 2

P.T.O.



11. Define the circle of curvature. 2
12. Replace the following polar equations by equivalent cartesian equations
 $r \cos \theta = -4$. 2
13. The graph of equation $r = a$ is 2

SECTION - C

Answer **any 4** questions from among the questions **14 to 19**. These questions carry **3 marks each** :

14. If $y = \sin(\sin x)$, prove that $\frac{d^2y}{dx^2} + \tan x \frac{dy}{dx} + y \cos^2 x = 0$. 3
15. Find the n^{th} derivative of $\frac{x}{x^2 + a^2}$. 3
16. Expand $\log \sin x$ in powers of $x - 2$. 3
17. If z is a function of x and y , prove that if $x = e^u + e^{-v}$, $y = e^{-u} - e^v$, then

$$\frac{\partial z}{\partial u} - \frac{\partial z}{\partial v} = x \times \frac{\partial z}{\partial x} - y \times \frac{\partial z}{\partial y}$$
. 3
18. Find the polar equation for the circle $x^2(y - 3)^2 = 9$. 3
19. What points satisfy the equations $r = 2$, $\theta = \frac{\pi}{4}$? 3

SECTION - D

Answer **any 2** questions from among the questions **20 to 23**. These questions carry **5 marks each** :

20. Differentiate $[x^{\tan x} + (\sin x)^{\cos x}]$. 5
21. Show that $\frac{x}{1+x} < \log(1+x) < x$ for $x > 0$. 5
22. If $u = \tan^{-1} \frac{x^3 + y^3}{x - y}$ prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$. 5
23. Find a spherical co-ordinate equation for the sphere $x^2 + y^2 + (z - 1)^2 = 1$. 5