K20U 3189

Reg. No. : ....

Name : ....

First Semester B.C.A. Degree (CBCSS – Supplementary) Examination, November 2020
(2014-2018 Admissions)
COMPLEMENTARY COURSE IN MATHEMATICS
1C01MAT – BCA : Mathematics for BCA – I

Time : 3 Hours Max. Marks : 40

SECTION – A

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

1. The Maclaurin's series representation of a function f(x) is
2. $\lim_{x \to 0} \frac{\sin x}{x}$ equals to
3. If $z = \frac{x+y}{\sqrt{x}+\sqrt{y}}$ then $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} =$
4. Convert (1, 0, 0) to Cyllindrical coordinates.

SECTION – B

Answer **any 7** questions from among the questions **5** to **13**. These questions carry **2** marks **each**.

5. If y = sin(sinx) prove that $\frac{d^2y}{dx^2} + \tan x \frac{dy}{dx} + y\cos^2 x = 0$.
6. If $e^{a\sin^{-1}x} = a_0 + a_1x + a_2x^2 + \ldots$ then $a_2 =$
7. Verify Lagrange's mean value theorem for the function $f(x) = e^x$ in [0, 1].
8. Evaluate $\lim_{x \to 0} x\log x$.

P.T.O.

9. If $U = \log\left(\frac{x^4 + y^4}{x + y}\right)$ then S.T. $x\frac{\partial U}{\partial x} + y\frac{\partial U}{\partial y} = 3$.

10. If $H = f(y - z, z - x, x - y)$, then show that $\frac{\partial H}{\partial x} + \frac{\partial H}{\partial y} + \frac{\partial H}{\partial z} = 0$.

11. Find the radius of curvature for the curve $r = a(1 - \cos\theta)$.

12. Find a polar equation for the conic $(x - 2)^2 + (y + 1)^2 = 5$.

13. Convert the equation $x^2 + y^2 + \left(z - \frac{1}{2}\right)^2 = \frac{1}{4}$ into spherical form.

SECTION – C

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

14. If $x^y y^x = 1$ find $\frac{dy}{dx}$.

15. Evaluate $\lim_{x \to 0} \log(\sin x) \tan x$.

16. If $U = \sin^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$ show that $x\frac{\partial^2 U}{\partial x^2} + y\frac{\partial^2 U}{\partial x \partial y} = \tan^2 U \frac{\partial U}{\partial x}$.

17. Find the radius of curvature of $\sqrt{x} + \sqrt{y} = \sqrt{a}$ at $\left(\frac{a}{4}, \frac{a}{4}\right)$.

18. If $\sin U = \frac{(x + 2y + 3z)}{\sqrt{x^8 + y^8 + z^8}}$ show that $x\frac{\partial U}{\partial x} + y\frac{\partial U}{\partial y} + z\frac{\partial U}{\partial z} = -3\tan U$.

19. Show by changing to Cartesian form that $r = 8\sin\theta$ is a circle and $r = \frac{2}{1 - \cos\theta}$ is a parabola.

SECTION – D

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

20. Expand $\sin(m\sin^{-1}x)$ in powers of x upto the terms of x^5 by Maclaurin's theorem and hence obtain the value of $\sin m\theta$ in powers of $\sin\theta$.

21. State Rolles theorem. Using it P. T. between any two roots of $e^x\cos x = 1$ there exists atleast one root of $\tan x = 1$.

22. State Euler's theorem on Homogenius functions. If $U = \frac{x^2y^2}{x^2+y^2}$, as an application of the theorem, S.T. $x^2\frac{\partial^2 U}{\partial x^2} + 2xy\frac{\partial^2 U}{\partial x \partial y} + y^2\frac{\partial^2 U}{\partial y^2} = 2U$.

23. Translate the equation $\rho = 2\cos\phi$ into Cartesian and cylindrical equations.
