K18U 2189

Reg. No. : ....

Name : ....

First Semester B.C.A. Degree (CBCSS – Reg./Supple./Improv.) Examination, November 2018
COMPLEMENTARY COURSE IN MATHEMATICS
1C01MAT-BCA : Mathematics for BCA – I
(2014 Admn. Onwards)

Time : 3 Hours | Max. Marks : 40

SECTION – A

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

1. The n^{th} derivative of $\sin(ax + b)$ is
2. If $f(x) = (x - 1)(x - 2)(x - 3)$ then find out two disjoint open intervals which contain zeros of the function $f'(x)$.
3. Which partial derivative corresponds to the limit $\lim_{h \to 0} \frac{f(x+h, y) - f(x, y)}{h}$?
4. Convert (0, 1, 0) to Spherical coordinates. **(1×4=4)**

SECTION – B

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

5. If $y = e^{\sinh^2 x}$ verify that $\frac{dy}{dx} - y\sinh(2x) = 0$.
6. Write the formula for $\frac{d^n y}{dx^n}$ when $y = \frac{1}{ax+b}$. Use it to deduce the formula for $\frac{d^n y}{dx^n}$ when $y = \log(ax + b)$.
7. Expand $\log(1 + x)$ by Maclaurin's theorem.
8. Using Rolle's theorem prove that between $\frac{\pi}{4}$ and $\frac{5\pi}{4}$ there exists a real number c such that $\sin c + \cos c = 0$.
9. Evaluate $\lim_{x \to 0} \frac{e^x - e^{-x} - 2\sin x}{x^2}$.
10. Verify that $\frac{\partial^3 u}{\partial x^2 \partial y} = \frac{\partial^3 u}{\partial y \partial x^2}$ if $u = 100x^3y^2 + x^2y^3$.

P.T.O.

11. Find $\frac{d^2y}{dx^2}$ if x = a(t + sint), y = a(1 – cost).

12. Find a polar equation for the conic $\frac{x^2}{9}+\frac{y^2}{4}=1$.

13. Convert the equation $z + r^2\cos 2\theta = 0$ into cartesian form. **(2×7=14)**

SECTION – C

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

14. Differentiate $x^{\sin x} + \sin^x x$.

15. Find the n^{th} derivative of $\sin^3 x$.

16. If f is differentiable in [a, b], S.T. there exists a number $c \in (a, b)$ such that $2c[f(b) - f(a)] = f'(c)(b^2 - a^2)$.

17. Evaluate $\lim_{x\to 0} (\cos x)^{\frac{1}{x^2}}$.

18. If $z = \sin(x + y)$, $x = at^2$, $y = 2at$, find $\frac{dz}{dt}$.

19. Find a spherical coordinate equation for the sphere $x^2 + y^2 + (z - 1)^2 = 1$. **(3×4=12)**

SECTION – D

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

20. Use Maclaurin's theorem to expand $\log(1 + e^x)$ to the terms containing x^4 and hence obtain the value of log (1 + e).

21. State Rolles theorem. Using it P.T. there is no real number k for which the equation $x^2 - 3x + k = 0$ has two distinct zeros in [0, 1].

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

23. Translate the equation $\rho = 6\cos\phi$ into cartesian and cylindrical equations. **(5×2=10)**
