Reg. No. : ..................................

Name : ..................................

**I Semester B.Sc. Degree (CBCSS-Reg./Supple./Improv.) Examination, November 2018**
**COMPLEMENTARY COURSE IN MATHEMATICS**
**1C01 MAT – PH : Mathematics for Physics and Electronics – 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 derivative of $\sinh^{-1}x$ w.r.t. x is

2. State Cauchy's mean value theorem.

3. Define the continuity of a function of two variables.

4. Find the Cartesian equation corresponding to the polar equation $r^2 = 4r\cos\theta$.

**(1×4=4)**

## SECTION – B

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

5. If $y = \sin(\sin x)$ prove that $\dfrac{d^2y}{dx^2} + \tan x\dfrac{dy}{dx} + y\cos^2 x = 0.$

6. Find the $n^{th}$ derivative of $\sin(ax + b)$.

7. Find the derivative of $\tan^{-1}\left(\dfrac{2x}{1-x^2}\right)$ with respect to $\sin^{-1}\left(\dfrac{2x}{1+x^2}\right)$.

8. Show that $x^3 - 3x^2 + 3x + 2$ is monotonically increasing in every interval.

**P.T.O.**

9. Find lim(x log x) as x tends to zero.

10. Determine $\lim(x-a)^{(x-a)}$ as $x \to a$.

11. Verify that $\dfrac{\partial^3 u}{\partial y \partial x^2} = \dfrac{\partial^3 u}{\partial x^2 \partial y}$, where $u = y^2 e^x + x^2 y^3$.

12. Find the radius of curvature of the curve $y = 3x^2 + 4x$ at (1, 7).

13. Evaluate $\lim\limits_{x \to 0} \dfrac{x - \sin x}{x^3}$.

(2×7=14)

## SECTION – C

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

14. Find the Maclaurin's development of the function log (1 +x).

15. Separate the interval in which the polynomial $2x^3 - 15x^2 + 36x + 1$ is increasing or decreasing.

16. Evaluate $\lim\limits_{x \to 0} \dfrac{\cosh x - \cos x}{x \sin x}$.

17. If $u = \dfrac{1}{\sqrt{x^2 + y^2 + z^2}}$ show that $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} + \dfrac{\partial^2 u}{\partial z^2} = 0$.

18. Find the co-ordinates of the centre of curvature on the curve $y = x^2$ at $\left(\dfrac{1}{2}, \dfrac{1}{4}\right)$.

19. Find the spherical co-ordinates of the point that has rectangular co-ordinates $(x, y, z) = (4, -4, 4\sqrt{6})$

(3×4=12)

## SECTION – D

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

20. State Leibnitz on $n^{th}$ derivative of product of two functions. Using it find $n^{th}$ derivative of $x^2 e^x \cos x$.

21. Find $\lim\limits_{x \to 0} \dfrac{e^x - e^{-x} - 2x}{x^2 \sin x}$.

22. Find the radius of curvature at the point $x = at^2$, $y = 2at$ on the parabola $y^2 = 4ax$ and find the centre of curvature.

23. Find the equation in cylindrical and spherical co-ordinates if the equation is $z = \sqrt{x^2 + y^2}$ in rectangular system.

(5×2=10)

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