Reg. No. : ....

Name : ....

K19U 3185

I Semester B.Sc. Degree (CBCSS- Supplementary/Improvement)

Examination, November-2019

(2014 -2018 Admissions)

COMPLEMENTARY COURSE IN MATHEMATICS

1C01MAT-PH:MATHEMATICS FOR PHYSICS AND ELECTRONICS-1

Time : 3 Hours   Max. Marks :40

SECTION - A

I.   (First **Four** questions compulsory. **1** mark each)   **(4×1=4)**

1.   State Rolle's theorem.

2.   What is the derivative of $\sinh^{-1}x$.

3.   Define homogeneous function.

4.   Find the polar equation equivalent to the cartesian equation $x=2$.

SECTION - B

II. Answer any **seven** questions from among the questions 5 to 13. These
     questions carry **2** marks each.   **(7×2=14)**

5.   Expand $\sin x$ by Maclaurin's theorem.

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

7.   If $y=\cos^{-1}x$ Show that $(1-x^2)y_2 - xy_1 = 0$

8.   State Euler's theorem on homogeneous functions. Verify it for
     $z = ax^2 + 2hxy + by^2$

9. Find $\lim\limits_{x\to 0}\dfrac{1+\sin x-\cos x+\log(1-x)}{x\tan^2 x}$.

10. Evaluate $\lim\limits_{x\to\frac{\pi}{2}}\dfrac{\log(x-\frac{\pi}{2})}{\tan x}$,

11. Verify that $\dfrac{\partial^2 u}{\partial x\partial y}=\dfrac{\partial^2 u}{\partial y\partial x}$ for the following function $u=x\sin y+y\sin x$.

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

13. Define evolute and involute of a curve.

SECTION - C

III. Answer any **Four** questions from among the questions **14 to19**. These questions carry **3** marks each.   **(4×3=12)**

14. If $x=a(\cos\theta+\theta\sin\theta)$ and $y=a(\sin\theta-\theta\sin\theta)$ find $\dfrac{d^2y}{dx^2}$.

15. Differentiate $y=\dfrac{x^{\frac{1}{5}}(1-3x)^{\frac{2}{3}}}{(2-3x)^{\frac{3}{4}}(3-4x)^{\frac{4}{5}}}$.

16. Determine $\lim\limits_{x\to 0}(\cos x)^{\frac{1}{x^2}}$.

17. If $H=f(y-z, z-x, x-y)$ prove that $\dfrac{\partial H}{\partial x}+\dfrac{\partial H}{\partial y}+\dfrac{\partial H}{\partial z}=0$.

18. Find the co-ordinates of the centre of curvature of $xy=c^2$ at (c,c).

19. Find the rectangular co-ordinates of the point with spherical co-ordinates $\left(4,\frac{\pi}{3},\frac{\pi}{4}\right)$.

SECTION - D

IV. Answer any **Two** questions from among the questions **20 to 23**. These questions carry **5** marks each.   **(2×5=10)**

20. Find the evolute of the ellipse $\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}=1$.

21. Differentiate $(x)^{\tan x}+(\sin x)^{\cos x}$ with respect to x.

22. Find the cylindrical and spherical co-ordinates of a point that has rectangular co-ordinates $\left(4,-4,4\sqrt{6}\right)$.

23. Find the limits   a) $\lim\limits_{x\to 0}\dfrac{\tan x-x}{x-\sin x}$ (3)

     b) $\lim\limits_{x\to 0}\dfrac{\log x}{\cot x}$.   (2)

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