21U202 (Pages: 2) Name: ....

Reg.No: ....

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2022

(CBCSS - UG)

(Regular/Supplementary/Improvement)

CC19U MTS2 C02 / CC20U MTS2 C02 - MATHEMATICS - II

(Mathematics - Complementary Course)

(2019 Admission onwards)

Time : 2.00 Hours | Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

Answer ***all*** questions. Each question carries 2 marks.

1. Convert $\left(2,\pi\right)$ from polar coordinates to Cartesian coordinates.
2. Find inverse of $f(x)=x^5$ on $\left(-\infty , \infty\right)$.
3. Find the Cartesian form of the polar equation $r=\dfrac{5}{\sin\theta-2\cos\theta}$.
4. Evaluate $\displaystyle\int \sinh^2 x \quad dx$
5. Show that $\dfrac{d}{dx}\left(\sinh^{-1}x \right) =\dfrac{1}{\sqrt{1+x^2}}$.
6. Find $\lim_{n \rightarrow \infty}\left(\dfrac{\sin n}{n}\right)$
7. Write down the first four partial sums of the series $1-\frac{1}{2}+\frac{1}{3}-\frac{1}{4}+ ...$
8. Discuss the convergence of the harmonic series.
9. Test for convergence $\frac{2}{2}-\frac{1}{2}+\frac{2}{3} -\frac{1}{3}+\frac{2}{4}-\frac{1}{4}+\frac{2}{5}-\frac{1}{5}+ ...$
10. State the theorem of Gram-Schmidt orthogonalization process.
11. If $A=\begin{bmatrix} 0 & 2 & 4 & 0 \\ 1 & 2 & -2 & 3 \\ 5 & 1 & 0 & -1 \\ 1 & 1 & 1 & 2 \end{bmatrix}$. Evaluate C_{34}.
12. If A and B are orthogonal matrices, then prove that AB and BA are also orthogonal.

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer ***all*** questions. Each question carries 5 marks.

13. Find the area of the spherical surface of radius r obtained by revolving the graph of $y=\sqrt{r^2-x^2}$ on $[-r,r]$ about the x-axis.
14. Evaluate $\displaystyle \int_{0}^{1} \ln x\; dx$.
15. Evaluate $\displaystyle \int_{-1}^{1} \left(x^2+1\right)\; dx$ by the method of Riemann sums, taking 10 equally spaced points. Compare the answer with the actual value.
16. The vectors $u_{1}=\langle 1,0,0\rangle ,\; u_{2}=\langle 1,1,0\rangle, \; u_{31}=\langle 1,1,1\rangle$ form a basis for the vectorspace R^3. i. Show that u_{1}, u_{2} and u_{3} are linearly independent. ii. Express the vector $\langle 3,-4,8\rangle$ as a linear combination of u_{1}, u_{2} and u_{3}.
17. Find the rank of the matrix $\begin{bmatrix} 1 & -2 & 3 & 4 \\ 1 & 4 & 6 & 8 \\ 0 & 1 & 0 & 0 \\ 2 & 5 & 6 & 8 \end{bmatrix}$
18. Find the eigen values and the correponding eigen vectors of the matrix $A=\begin{pmatrix} 3 & 4 \\ -1 & 7 \end{pmatrix}$.
19. Compute A^m if $A=\begin{pmatrix} -1 & 2 \\ 0 & -3 \end{pmatrix}$. Hence find A^6

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any ***one*** question. The question carries 10 marks.

20. Solve the linear system using Gauss-Jordan elimination method $2x_{1}+6x_{2}+x_{3}=7$ $x_{1}+2x_{2}-x_{3}=-1$ $5x_{1}+7x_{2}-4x_{3}=9$
21. Find the matrix P that diagonalizes the matrix $A=\begin{bmatrix} 1 & -1 & 1 \\ 0 & 1 & 0\\ 1 & -1 & 1 \end{bmatrix}$. Also find the diagonal matrix D such that $D=P^{-1}AP$

(1 × 10 = 10 Marks)

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