17P159 (Pages:2) Name:…………………

Reg. No…………………..

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2017

(Regular/Supplementary/Improvement)

(CUCSS-PG)

CC15PST1C02 – ANALYTICAL TOOLS FOR STATISTICS-I

(Statistics)

(2015 Admission Onwards)

Time: Three Hours Maximum: 36 Weightage

PART A

Answer ***all*** questions. Weightage 1 for each question.

1. State Jordan's inequality.
2. Define infinite fourier transform of a function.
3. State Laurent's theorem.
4. Define limit of a multivariable function.
5. State Morera's theorem..
6. What do you mean by zeroes of a complex function. Give example.
7. State inverse function theorem.
8. State Taylor's theorem for a multivariable function .
9. If L {F (t)} =f (s) then find L { $3e^{2t} + 4e^{-3t}$}.
10. State Cauchy's integral formula.
11. Define Directional derivative.
12. State Lioville's theorem.

(12x1=12 Weightage)

PART B

Answer any ***eight*** questions. Weightage 2 for each question.

13. State and prove Cauchy Residue Theorem.
14. Show that the function $e^{1/z}$ has an isolated essential singularity at $z = 0$.
15. Prove that the function $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ satisfies Laplace equation and determine corresponding analytic function.
16. Find the minimum of $f(x, y, z) = -x^2 - 2y^2 - z^2 + xy + z$ subject to the condition $x + y + z = 35$.
17. Find the Laplace transform of $\frac{sinat}{t}$. Does the transform of $\frac{cosat}{t}$ exist?
18. State and prove Taylor's theorem.

19. Find the Fourier series to represent f(x) where, $f(x) = \begin{cases} x, 0 < x < 1 \\ 0, 1 < x < 2 \end{cases}$

20. Establish Jordan Lemma.

21. Using Convolution theorem, find $L^{-1}\left\{\frac{1}{(s+a)(s+b)}\right\}$

22. Prove that the function $f(x,y) = \sqrt{|xy|}$ is not differentiable at (0, 0) but that the partial derivatives $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ exist at (0,0) and have the value zero.

23. Establish the Cauchy Riemann conditions for an analytic function in polar form.

24. Using Laplace transform method, solve $y''(t) + y(t) = t$ given that y' (0)=1,y(π)=0.

(8x2 = 16 Weightage)

PART C

Answer any ***two*** questions. Weightage 4 for each question.

25. State and prove Poisson Integral Formula.

26. Derive the necessary and sufficient condition for a function to be analytic.

27. a) State Fourier Integral theorem.

    b) Find finite Fourier sine and cosine transform of $f(x) = x^2, 0 < x < 4$.

28. By contour integration, prove that $\int_0^\infty \frac{\sin x^2 dx}{x} = \frac{\pi}{4}$ and hence deduce that $\int_0^\infty \frac{\sin x dx}{x} = = \frac{\pi}{2}$.

(2x4 = 8 Weightage)

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