U.G. 2nd Semester Examination - 2021

STATISTICS

[HONOURS]

Course Code : STAT-H-CC-T-03

(Mathematical Analysis)

Full Marks : $37\frac{1}{2}(30+7\frac{1}{2})$ Time : $1\frac{1}{2}$ Hour

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Notations and symbols have their usual meaning.

1. Answer any **five** questions: 2×5=10

   a) Define boundary point of a subset of R with an example.

   b) Find the domain and range of the function $f(x,y)=\sqrt{16-4x^2-y^2}$.

   c) When is a series said to be absolutely convergent? Give an example.

   d) Define a monotone sequence with example.

   e) Write down the Taylor series expansion of $\cos \pi x$ about x = ½.

   f) Show that {n/(n+1)} is a Cauchy sequence.

   g) Find y_2 if sin x + cos y = 1.

   h) Define Beta and Gamma functions and write their relationship.

2. Answer any **two** questions: 5×2=10

   a) Define a countable set. Show that the set of rational numbers is countable.

   b) State and prove Rolle's theorem.

   c) If $y=\sin(m\sin^{-1}x)$, show that $(1-x^2)y_2-xy_1+m^2y=0$.

   d) Evaluate $\int_1^2\int_1^x (x^2/y^2)\,dy\,dx$.

3. Answer any **one** question: 10×1=10

   a) i) Show that the area of a rectangle inscribed in a circle has maximum area when it is a square. 6

   ii) Verify whether Euler's theorem is satisfied for the function u = (x–y)/(x+y). 4

   b) i) Evaluate $\int \frac{dx}{(1-3x)\sqrt{x+2}}$. 5

   ii) Applying ratio test examine the convergence of the series

   $\frac{1}{2}+\frac{2}{2^2}+\frac{3}{2^3}+\ldots+\frac{n}{2^n}+\ldots.$ 5

[Internal Assessment: $7\frac{1}{2}$]

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