



Registration Number:

Date & session:

ST. JOSEPH'S UNIVERSITY, BENGALURU -27
M.Sc. (STATISTICS) – I SEMESTER
SEMESTER EXAMINATION: OCTOBER 2022
(Examination conducted in December 2022)
ST 7421 – Mathematical Analysis and Linear Algebra

Time: 2 Hours

Max Marks: 50

This paper contains TWO printed pages and ONE part

PART-A

Answer **FIVE FULL** Questions

- A) Define (i) Interior point of a set (ii) Limit point of a set with an example each.
B) Define Metric Space. Show that the following are metric spaces. Show that $d(x, y) = |x - y|$ is a metric for $x, y \in \mathbb{R}$. (4+6)
- A) Define point-wise Continuity and Uniform Continuity of a function.
B) Prove that any function continuous in closed interval is uniformly continuous. (3+7)
- A) State and prove Cauchy's general principal of convergence of sequence..
B) Prove that absolute Convergence of a series of arbitrary terms implies its convergence. (5+5)
- A) Examine for uniform convergence of $f_n(x) = x/n, 0 \leq x \leq a < \infty$.
B) State and Prove Cauchy's criterion for uniform convergence of sequence of functions. (4+6)
- A) Define Radius of convergence of power series. Obtain radius of convergence of $\sum_{n=0}^{\infty} x^n/n^2$.
B) if $\int_a^b f_1(x)dg(x)$ and $\int_a^b f_2(x)dg(x)$ exists then prove that

$$\int_a^b (f_1(x) + f_2(x))dg(x) = \int_a^b f_1(x)dg(x) + \int_a^b f_2(x)dg(x) \quad (4+6)$$
- A) Evaluate the double integral $\iint_S (2x^3 + y^3)d(x, y)$, $S = \{(x, y): x \geq 0, x^2 + y^2 \leq 1\}$.
B) State and prove completion theorem. (5+5)

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7. A) Define a basis of a vector space and subspace of a vector space and dimension of a vector space.

B) Find row echelon form of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 3 & 6 & 9 \end{bmatrix}$. Hence find the rank A.

c) Define quadratic forms and different classifications of quadratic forms. (3+4+3)