Model Question Paper

First Semester MSc Degree Examination

Statistics with Specialization in Data Analytics

(2020 Admission onwards)

STSD 211: ANALYTICAL TOOLS FOR STATISTICS

Time 3 hours Max: 75 marks

Part- A

(Answer any **FIVE** questions, each carries **3** marks)

1. Define metric space. Give an example.
2. Define a complete metric space.
3. Define Riemann integral.
4. State the additive property of functions of bounded variation
5. Define maxima and minima of continuous functions.
6. Define subspace of a vector space?
7. Define basis of a vector space.
8. Define linear transformation?
9. Define eigen values and eigen vectors of a matrix.
10. Define Moore-Penrose g-inverse.

Part-B

(Answer any **THREE** questions, each carries **12** marks)

11. State and prove Bolzano Weierstrass theorem in R^n
12. i)Define uniform continuity
    ii) Prove that a function which is uniformly continuous on a metric space is also continuous .Is the converse true ? Prove or disprove.
13. i) State fundamental theorem of integral calculus
    ii)Show that the function [x], where [x] denote the greatest integer not greater than x, is integrable in [0,3] and hence evaluate $\int_0^3 [x] dx$
14. i) Define functions of bounded variation? If f is a continuous function on [a, b] and if f' exists and is bounded in [a,b], then show that f is of bounded variation on [a,b]
    ii) Determine whether or not the following function f is of bounded variation on [0,1]
    $f(x) = x^2 \sin\left(\frac{1}{x}\right), if\ x \neq 0 \wedge f(0) = 0$
15. If xyz=abc, Show that the minimum value of bcx + cay +abz is 3abc
16. Find the local extreme values of $f(x,y)=x^3+y^3-3xy$

Part-C

(Answer any **TWO** questions, each carries **12** marks)

17. a) Prove that any subset of a subspace S of a vector space V is independent if S is independent.

    b) Show that S={$\square_1$,$\square_2$} where $\square_1$=(1.2) and $\square_2$=(2,1) is a basis of R^2

18. Solve the following equations by Gauss-Jacobi iteration method

$$x+ y+4z=9$$
$$8x-3y+2z=20$$
$$4x+11y-z=33$$

19. Show that definiteness of a quadratic form is invariant under non-singular linear transformation.

20. Find the Moore-Penrose g-inverse

$$A= \begin{bmatrix} 2 & 2 & -2 \\ 2 & 2 & -2 \\ -2 & -2 & 6 \end{bmatrix}$$

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