18STP01

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION MAY 2022
(First Semester)

Branch - STATISTICS

REAL ANALYSIS AND MATRIX ALGEBRA

Time: Three Hours Maximum: 50 Marks

SECTION – A (5 Marks)
Answer **ALL** Questions
ALL Questions carry **EQUAL** Marks (5 x 1 = 5)

1) A sufficient condition for $\{f_n\}$ to be uniformly convergent is that $\{f_n\}$ is
i) Uniform Sequence ii) Cauchy Sequence
iii) Uniform Cauchy Sequence iv) None of these

2) If $y = ax^2+b$, then dy/dx at x = 2 is equal to
i) 2a ii) 3a iii) 4a iv) 5a

3) When mean is 40 and variance is 16, then the coefficient of variation is
i) a, b ϵ R, a>b, and f:[a,b]→Z ii) a, b ϵ R, a<b, and f:[a,b]→Z be bounded
iii) a, b ϵ R, a>b, and f:[a,b]→R iv) a, b ϵ R, a<b, and f:[a,b]→R be bounded

4) If P^* is a refinement of P, then
i) $L(P, f, \alpha) \leq L(P^*, f, \alpha)$ ii) $L(P, f, \alpha) \geq L(P^*, f, \alpha)$
iii) $U(P, f, \alpha) \leq U(P^*, f, \alpha)$ iv) None of these

5) The lowest eigen value of the 2X2 matrix $\begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}$ is
i) 1 ii) 2 iii) 3 iv) 4

SECTION – B (15 Marks)
Answer **ALL** Questions
ALL Questions carry **EQUAL** Marks (5 x 3 = 15)

6) a) Prove that if f is uniformly continuous on B, it is so on each subset A⊆B.
(OR)
b) State the properties of continuity of a real valued function.

7) a) Determine the Maxima and Minima of the function $f(x, y) = 2x^2 - 4xy + y^4 + 2$.
(OR)
b) Describe continuity and differentiability of functions of two variables.

8) a) Define upper and lower Riemann integrals.
(OR)
b) If f is continuous on [a, b] prove that $f \in R(\infty)$ on [a,b].

9) a) Define upper and lower Riemann – Stieltjes integrals.
(OR)
b) Define algebra of Riemann – Stieltjes integrals function.

10) a) Explain Rank and inverse of matrices and state its properties.
(OR)
b) Explain quadratic form and the nature of the quadratic form.

SECTION - C (30 Marks)

Answer **ALL** questions

ALL Questions carry **EQUAL** Marks (5 X 6 = 30)

11) a) Prove that every function defined and continuous on a closed interval attains its bounds.

(OR)

b) Prove that the sequence $\{f_n\}$, where $fn(x) = x_n{-}1\ (1-x)$ converges uniformly in the interval [0, 1].

12) a) State and prove the Algebra of Limits.

(OR)

b) Discuss maxima/minima of the following function:

$$f(x, y) = 2(x^4 + y^4 + 1) - (x + y)^2$$

13) a) State and prove the Darboux's Theorem.

(OR)

b) State and prove the First Mean value theorem.

14) a) If P^* is a refinement of P prove that $L(P, f, \alpha) \leq L(P^*, f, \alpha)$ and $U(P^*, f, \alpha) \leq U(P^*, f, \alpha)$

(OR)

b) State and prove the necessary and sufficient condition for Riemann – Stieltjes integrals.

15) a) State and prove the Cayley – Hamilton Theorem.

(OR)

b) Discuss G inverse and also explain the method of finding G – inverse.

Z-Z-Z END