

**TOTAL TIME: 3 HOURS**

**TOTAL MARKS: 80**

- (1) Question 1 is compulsory.
- (2) Attempt any **three** from the remaining questions.
- (3) Figures to the right indicate full marks.

- Q.1 a) What is a structured thinker? Why is it important and how can it help? **5 mks**  
 b) Explain local and global optima in detail. **5 mks**  
 c) Explain classical statistical inference pipeline in detail. **5 mks**  
 d) Explain rectangular data in detail. **5 mks**

- Q.2 a) Describe Rank nullity theorem in detail. **10 mks**  
 b) What is hypothesis testing? Explain the procedure in detail. **10 mks**

- Q.3 a) Explain properties of determinant in detail. Compute Determinant A where **10 mks**

A =

1	-4	2
-2	8	-9
-1	7	0

- b) What is random permutation test? Explain exhaustive and bootstrap permutation test in detail. **10 mks**

- Q.4 a) What is structured data? Explain types of structured data in detail. **10 mks**  
 b) Explain Confusion Matrix? Explain Recall, Precision and F-measure with example. **10 mks**

- Q.5 a) Describe Central Limit Theorem. **10 mks**  
 b) Explain Data distribution in detail. **10 mks**

- Q.6 Write short note on - **20 mks**  
 a) Need of statistic and optimization from the data science perspective  
 b) Binary and categorical data  
 c) Unconstrained optimization  
 d) Student's t-distribution

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