Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 05-12-2025 **Time:** 01:00pm – 04:00pm

School : SOCSE	**Program :** B.Tech. CSD, CST,	
Course Code : CSD3419	**Course Name :** Edge Computing for Data Science	
Semester : VII	**Max Marks :** 100	**Weightage :** 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**24**	**24**	**26**	**26**	

Instructions:

(i) Read all questions carefully and answer accordingly.
(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	How does edge computing reduce network bandwidth?	**2 Marks**	**L2**	**CO1**
2.	What is an edge gateway’s function in edge computing?	**2 Marks**	**L1**	**CO1**
3.	Highlight the purpose of Feature Engineering?	**2 Marks**	**L2**	**CO2**
4.	Clarify the importance of a Confusion Matrix in assessing the performance of a machine learning model.	**2 Marks**	**L2**	**CO2**
5.	What is model pruning? Why is it used?	**2 Marks**	**L1**	**CO3**
6.	What is Edge AI? Give two advantages of using Edge AI over cloud-based AI.	**2 Marks**	**L1**	**CO3**
7.	State two limitations of Edge AI systems.	**2 Marks**	**L1**	**CO3**
8.	Define secure aggregation in the context of federated learning.	**2 Marks**	**L1**	**CO4**
9.	What is TLS and why is it used?	**2 Marks**	**L1**	**CO4**
10.	Why is latency critical in real-time edge applications?	**2 Marks**	**L2**	**CO4**

Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	Describe the layered architecture of a typical edge computing system.	**10 Marks**	**L2**	**CO1**
	b.	Explain how edge computing is critical for autonomous systems.	**10 Marks**	**L2**	**CO1**
Or					
12.	**a.**	A smart healthcare system is being implemented in a city to monitor patients remotely using IoT-enabled devices such as wearable sensors, emergency alert systems, and connected hospital equipment. The system requires real-time patient monitoring, quick alert generation and secure handling of sensitive medical data. **i.** Explain the role of edge computing in this smart healthcare scenario. **ii.** Analyze specific use cases of edge computing in healthcare IoT. **iii.** Evaluate the benefits and limitations of using edge computing instead of a fully cloud-based approach. **iv.** Justify the adoption of edge computing in this scenario and suggest workflow or architecture**.**	**20 Marks**	**L4**	**CO1**

13.	**a.**	Explain the concept of over-fitting in machine learning models. Discuss how this issue can be identified and what techniques can be employed to mitigate.	**10 Marks**	**L2**	**CO2**
	b.	Discuss the role of feature engineering in improving the performance of machine learning models. Provide examples of at least three different feature engineering techniques.	**10 Marks**	**L2**	**CO2**
Or					
14	**a.**	You are a data analyst at a retail company. You have received a CSV file named sales_data.csv containing sales information with columns: OrderID, CustomerID, Product, Quantity, Price, and OrderDate. **Tasks:** **i.** **Load** the CSV file into a Pandas DataFrame. **ii.** **Inspect** the first 5 rows and summary information of the dataset. **iii.** **Filter** the data to show all orders where Quantity > 5. **iv.** **Add** a new column TotalPrice = Quantity * Price. **v.** **Sort** the data by TotalPrice in descending order. **vi.** **Drop** the OrderDate column after analysis. Demonstrate how to perform the above tasks using Pandas in Python, and show the output at each step**.**	**20 Marks**	**L3**	**CO2**

15.	**a.**	A smart city is implementing real-time video analytics to monitor traffic congestion, detect accidents, manage public safety, and optimize infrastructure usage. The city wants a reliable, low-latency system capable of processing multiple video streams simultaneously. **i.** Analyze the architecture of a real-time video analytics system. **ii.** Describe the end-to-end workflow **iii.** Discuss applications in smart cities. **iv.** Justify the design choices for ensuring low latency, scalability, and reliability. (Include diagrams where appropriate)	**20 Marks**	**L4**	**CO3**
		Or			
16.	**a.**	Explain quantization in detail. Describe types of quantization and advantages for deployment on edge devices.	**10 Marks**	**L2**	**CO3**
	b.	Discuss NVIDIA Jetson platform for Edge AI. Explain GPU acceleration and example applications in robotics & automation.	**10 Marks**	**L2**	**CO3**

17.	**a.**	Explain homomorphic encryption in edge computing. Compare partial, full, and hybrid homomorphic encryption.	**10 Marks**	**L2**	**CO4**
	b.	Explain latency, throughput, and energy consumption metrics in edge computing. Discuss the relationship among them and methods for optimization.	**10 Marks**	**L2**	**CO4**
		Or			
18.	**a.**	A smart logistics company operates a fleet of autonomous delivery vehicles equipped with sensors, cameras, and GPS modules. The company is deciding whether to process critical data (such as obstacle detection, route optimization, and vehicle health monitoring) on the cloud or at the edge using onboard computing units. **i.** As the lead systems architect, you are asked to evaluate the performance trade-offs between cloud computing and edge computing in this scenario, focusing specifically on latency, reliability and power usage. **ii.** Frame your answer by analyzing which approach is more suitable for each performance factor and justify your reasoning with respect to the autonomous vehicle environment.	**20 Marks**	**L4**	**CO4**