

**M.S.C. COMPUTER SCIENCE WITH SPECIALIZATION IN DATA SCIENCE
THIRD SEMESTER EXAMINATION, NOVEMBER 2023.**

22-359-0319 DEEP LEARNING

(Regular)

Time : 3 Hours

Maximum Marks :50

Write any FIVE questions.

(Each question carries 10 Marks)

No	QUESTIONS	MARKS	CO	BL	PL
1.	<p>a. What are the properties that should be satisfied by a McCulloch Pitts neuron?</p>	5	CO1	L2	1.6.1
	<p>b. Consider the neural network of McCulloch –Pitts neurons shown in figure below. Assume each neuron N3, N4, N5 has a threshold of 2. Define the response of neuron N5 at time t in terms of the activations of the input neuron N1, N2 at appropriate time. Assume N1 and N2 =1.</p>	5	CO1	L3	1.7.1

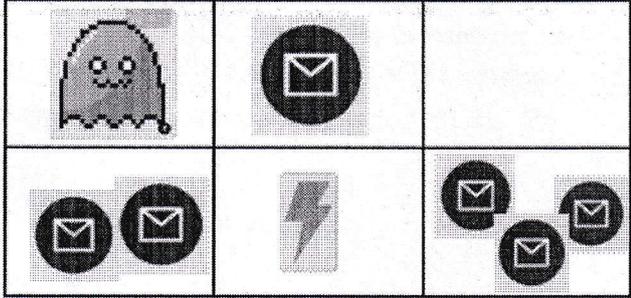
OR

2.	<p>a. Briefly explain the steps in back propagation algorithm.</p>	5	CO1	L2	1.6.1
	<p>b. Using back propagation algorithm Show the first iteration of the below given neural Network. Assume the actual output is 1 and learning rate is 0.2. The bias for each hidden nodes is 0.3 and output node is 0.2.</p>	5	CO1	L3	1.7.1

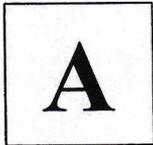
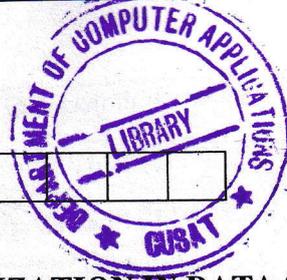
3.	a.	Explain with neat diagram each layers of a CNN model.	6	CO2	L2	1.6.1
	b.	Interpret the below given model summary of a CNN. <pre> Model: 'sequential' ----- Layer (type) Output Shape Param # ----- conv2d (Conv2D) (None, 24, 24, 20) 520 max_pooling2d (MaxPooling2D) (None, 12, 12, 20) 0 conv2d_1 (Conv2D) (None, 8, 8, 50) 25050 max_pooling2d_1 (MaxPooling2 (None, 4, 4, 50) 0 flatten (Flatten) (None, 800) 0 dense (Dense) (None, 500) 400500 dense_1 (Dense) (None, 10) 5010 ----- Total params: 431,080 Trainable params: 431,080 Non-trainable params: 0 </pre>	4	CO2	L3	2.5.3
OR						
4.	a.	What is need of skip connections in a residual network?	4	CO2	L2	1.6.1
	b.	With neat diagram explain the architecture of Alex Net.	6	CO2	L2	1.6.1
OR						
5.	a.	Explain the different applications of an autoencoder.	5	CO3	L2	1.6.1
	b.	Describe how autoencoders can be used to denoise the input image.	5	CO3	L2	1.6.1
OR						
6.		Explain in detail how to train a GAN to generate realistic images.	10	CO3	L2	1.6.1
OR						
7.		With neat diagram explain the working of LSTM	10	CO4	L2	1.6.1
OR						
8.	a.	Explain the architecture of GRU and the mechanism by which various gates of a GRU cell helps in the storage of relevant information.	10	CO4	L2	2.5.3

9.	a.	Explain the concept of exploration exploitation tradeoff in reinforcement learning algorithms. How epsilon greedy algorithm can be used to solve the problem of exploration exploitation tradeoff.?	5	CO5	L2	1.6.1
	b.	With an example explain the need of the component "return" in reinforcement learning algorithms.	5	CO5	L2	1.6.1

OR

10.	a.	<p>Given below is a maze environment along with the possible states and rewards. Explain how Q learning can be applied to solve this reinforcement learning problem of maze if initially the agent moves to the state with one mail on the left side of the agent. Action possible for each state for the agent is move up, move down, move right and move left.</p> <div style="text-align: center;">  </div> <p><u>Reward at each state:</u> Empty state=0 One mail =+1 Two Mail=+2 Three Mail= +10 If the agent reaches to the state with fire =-10</p>	10	CO5	L3	1.7.1
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22-359-0319 DEEP LEARNING

(Regular)

Time : 3 Hours

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Write any FIVE questions.

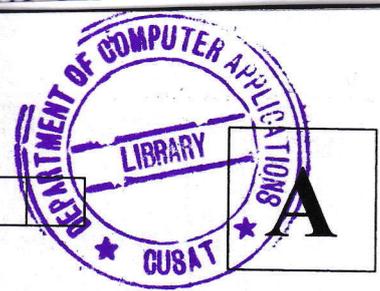
(Each question carries 10 Marks)

No	QUESTIONS	MARKS	CO	BL	PL
1.	a. What are the properties that should be satisfied by a McCulloch Pitts neuron?	5	CO1	L2	1.6.1
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OR					
2.	a. Briefly explain the steps in back propagation algorithm.	5	CO1	L2	1.6.1
	b. Using back propagation algorithm Show the first iteration of the below given neural Network. Assume the actual output is 1 and learning rate is 0.2. The bias for each hidden nodes is 0.3 and output node is 0.2. 	5	CO1	L3	1.7.1

3.	a.	Explain with neat diagram each layers of a CNN model.	6	CO2	L2	1.6
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M.SC. COMPUTER SCIENCE WITH SPECIALIZATION IN DATA SCIENCE
 THIRD SEMESTER EXAMINATION, NOVEMBER 2023.

22-359-0319 DEEP LEARNING

(Regular)

Time : 3 Hours

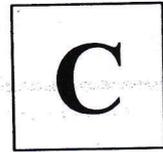
Maximum Marks :50

Write any FIVE questions.
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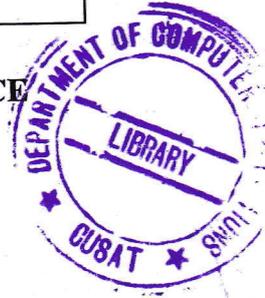
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2.	a. Briefly explain the steps in back propagation algorithm.	5	CO1	L2	1.6.1
	b. Using back propagation algorithm Show the first iteration of the below given neural Network. Assume the actual output is 1 and learning rate is 0.2. The bias for each hidden nodes is 0.3 and output node is 0.2. 	5	CO1	L3	1.7.1

M.Sc.(DS).III/11.23.003 Reg.No.

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**M.SC. COMPUTER SCIENCE WITH SPECIALIZATION IN DATA SCIENCE
THIRD SEMESTER EXAMINATION NOVEMBER 2023**



22-359-0321 BIG DATA ANALYTICS

(Regular)

Time: 3 Hours

Maximum Marks :50

Write any FIVE questions.

Each question carries 10 Marks

No		QUESTIONS	MARKS	CO	BL	PI
1	a.	“HDFS is fault-tolerant”- Comment on the statement with the help of HDFS Architecture.	5	CO1	L2	2.6.2
	b.	Compare and Contrast HIVE and PIG. Briefly describe the functionality of these tools in Apache Hadoop.	5	CO1	L2	2.6.5
OR						
2	a.	Why do we need a Data Lake? Discuss the challenges of Data Lake.	5	CO1	L2	2.6.2
	b.	Identify the role of Zookeeper in Apache Hadoop.	5	CO1	L2	2.6.2
3	a.	Explain the critical libraries that constitute the Spark Ecosystem.	5	CO2	L2	2.6.2
	b.	Describe the methods to create RDDs in Spark.	5	CO2	L2	2.5.2
OR						
4	a.	Describe the operations supported by RDDs. Analyse Lazy evaluation of RDDs with suitable examples.	8	CO2	L2	2.5.2
	b.	What do you mean by the term RDD Lineage?	2	CO2	L2	2.5.2
5	a.	What are some of the common transformations on DStreams supported by Spark Streaming ?	5	CO3	L2	2.6.3
	b.	Analyse the working of Spark Streaming architecture with a neat sketch.	5	CO3	L2	2.6.2
OR						
6	a.	Identify the key features and characteristics of Lambda Architecture.	5	CO3	L2	1.7.1
	b.	Analyse Real-time stream processing in Kappa Architecture.	5	CO3	L2	2.6.2

7	a.	Using the MongoDB shell, demonstrate how to: <ol style="list-style-type: none"> I. Establish a connection to a MongoDB database. II. Create a new database and collection. III. Insert documents into a collection. IV. Sort and limit records in the shell. V. Update Documents in a Collection. VI. Return Specific Fields using the "find()" method and projection. <p>Give examples of the above cases and their sample outputs appropriately.</p>	6	CO4	L3	2.8.2
	b.	What is the importance of Indexing? How should indexing be employed in MongoDB, and what are the situations in which it can be advantageous and when can it be harmful? Give an example of creating an index in MongoDB.	4	CO4	L2	2.8.3

OR

8	a.	What is Hive, and what makes it useful for working with data? Can you highlight a few key features that make it user-friendly for data processing?	4	CO4	L2	4.6.1
	b.	In what scenarios or use cases is it advisable to use HBase for data storage, and conversely, are there situations where HBase may not be the most suitable solution, and alternative approaches should be considered?	4	CO4	L3	5.5.1
	c.	In MongoDB, explain the basic structure of a document and how it differs from a traditional table in a relational database.	2	CO4	L2	5.5.1

9	Given a data set iris.csv with fields sepal_length, sepal_width, petal_length, petal_width and species.				10	CO5	L3	4.4.2
	sepal_length	sepal_width	petal_length	petal_width				
	5.1	3.5	1.4	0.2	setosa			
	4.9	3	1.4	0.2	setosa			
	4.7	3.2	1.3	0.2	setosa			
	4.6	3.1	1.5	0.2	setosa			
	4.6	3.4	1.4	0.3	setosa			
	7	3.2	4.7	1.4	versicolor			
	6.4	3.2	4.5	1.5	versicolor			
	6.9	3.1	4.9	1.5	versicolor			

5.5	2.3	4	1.3	versicolor
4.9	2.4	3.3	1	versicolor
6.6	2.9	4.6	1.3	versicolor
5.2	2.7	3.9	1.4	versicolor
7.1	3	5.9	2.1	virginica
6.3	2.9	5.6	1.8	virginica
6.5	3	5.8	2.2	virginica
7.6	3	6.6	2.1	virginica

- a. Write code in PySpark to Initialize Spark Session and Spark Context.
- b. Create a data frame in PySpark with first row being headers and display the first 5 rows.
- c. Merge given features to create a column vector 'features'.
- d. Split data into training and test sets for Naive Bayes classification.
- e. Given a list of words, ("the", "quick", "brown", "fox", "jumps", "over", "the", "lazy", "dog")
 - (i) Create an RDD named 'words'.
 - (ii) Create a new RDD 'wordPair' from 'words' by applying map transformation which takes the first letter of each word.

OR

10

Consider a collection of literature survey made by a researcher in the form a text document Input.txt with respect to cloud and big data analytics.

Input.txt

Cloud is used to store large volume of data. Big data analytics processes large volume of data to draw conclusions.

- a. Implement a MapReduce word count program in PySpark to count the occurrence of keywords.
- b. Represent the phases in Map Reduce process with a neat sketch

10

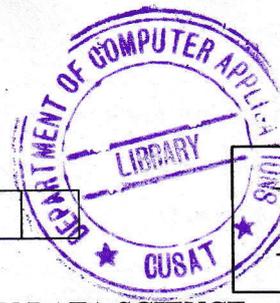
CO1

L3

4.4.2

M.Sc.(DS).III/11.23.002 Reg.No.

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**M.SC. COMPUTER SCIENCE WITH SPECIALIZATION IN DATA SCIENCE
THIRD SEMESTER EXAMINATION NOVEMBER 2023**

22-359-0311 Explainable Artificial Intelligence

(Regular)

Time : 3 Hours

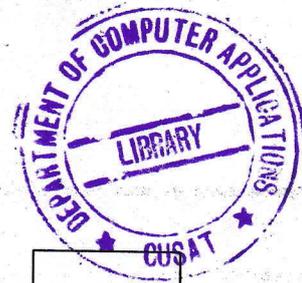
Maximum Marks :50

Write any FIVE questions.

(Each question carries 10 Marks)

Qn. No		Questions	Marks	- CO	BL	PI
1	a	What is Explainable AI in the context of Machine Learning? Why do we need explainable models?	5	CO1	L2	1.7.1
	b	What are the different ways to make a Machine Learning model explainable?	5	CO1	L2	1.7.1
OR						
2	a	Explain why an interpretable Machine Learning model needs an explanation?	5	CO1	L2	1.7.1
	b	Write the properties of explanation in terms of global and local perspective.	5	CO1	L2	1.7.1
OR						
3	a	Implement a model agnostic explanation using LIME in a deep learning model.	5	CO2	L3	1.2.1
	b	How is shapley (SHAP) used in machine learning to explain classification or regression models? Write mathematical formulations for estimating shapely values for an attribute.	5	CO2	L3	1.2.1
OR						
4		Consider Wine.csv file with attributes fixed acidity, volatile acidity, citric acid, residual sugar, chlorides, free sugar dioxide, total sulphur dioxide, density, pH, sulphates, alcohol. Implement linear regression using the necessary Python library to estimate the quality of alcohol on scale of 1 to 10, the higher the better. Explain the model using linear regression.	10	CO2	L3	2.5.2

5	a	Why batch normalisation is used in DNN? Elucidate steps involved in applying batch normalisation in a neural network model?	4	CO3	L3	2.5.2
	b	Build an agnostic explanation for a black box model for classifying a set of images with VGG16, and apply augmentation to input dataset. Write a python code with occlusion as explain ability to highlight the features that are important .	6	CO3	L3	1.2.1
OR						
6	a	Write a python code to highlight relevant feature for tabby cat and the dog classification problem using GRADCAM.	6	CO3	L3	1.2.1
	b	“Gradient-Weighted Class Activation Maps(Grad-CAM) are an improvement over class Activation Maps(CAM) as it overcomes limitation of learning weights in CAM”, Justify foresaid statement.	4	CO3	L3	1.7.1
OR						
7		Implement CEM approach using MNIST dataset that will explain how the number 5 could be predicted because it lacks the features that a 3 or an 8 contain.	10	CO3	L3	1.7.1
OR						
8		What do you understand by counterfactual explanations? How are counterfactual examples generated? Explain loss function for generating counterfactual examples. List advantages and disadvantages for counterfactual explanation.	10	CO4	L2	1.7.1
OR						
9	a	Formally define adversial examples. Explain the procedure to generate adversial examples using Fast Gradient Sign Method (FGSM)	5	CO5	L3	1.2.1
	b	Using Generative Adversial Network on images, describe the process of generating adversial examples. Write Mathematical Foundation.	5	CO5	L3	1.7.1
OR						
10		Write four approaches to defend against adversial attack. How are SHAP signatures used to defend against adversial attacks.	10	CO5	L3	1.2.1



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**M.SC. COMPUTER SCIENCE WITH SPECIALIZATION IN DATA SCIENCE
THIRD SEMESTER EXAMINATION NOVEMBER 2023**

22-359-0313 Network Security Essentials

(Regular)

Time: 3 Hours

Maximum Marks :50

Each question carries 10 Marks

Sl.N O		Questions	Marks	CO	BL	PI
1.		Explain Vulnerability, Threat, Attack and Control Measures through examples.	10	CO1	L2	1.7.1
OR						
2.		Explain the models for Network Security and Access Control.	10	CO1	L2	1.7.1
3.	a.	Describe any 4 types of malware.	4	CO2	L2	1.7.1
	b.	What are the different faces of a virus? Briefly explain each.	6		L2	
OR						
4.		Explain different types of viruses.	10	CO2	L2	1.7.1
5.	a	Identify the type of evidence <ol style="list-style-type: none"> 1. A USB drive containing malware obtained from the crime scene. 2. An admission by the suspect that he was engaged in data theft. 3. Information from an online forum(without verifying its credibility) about suspect's action. 4. A forensic investigator collected evidence from log file , last log on, network log on recently accessed files etc. 5. The employment contract digitally signed by an employer. 6. An employee's statement about the content of an administrator's email without direct knowledge of the 	6	CO3	L2	4.4.1 2.7.1

		message's contents.				
	b	What are different possibilities to collect the evidence when a compromise has been detected? Explain possible dangers while collecting evidence.	4		L2	
OR						
6.		Elucidate different steps in cyber forensic examination.	10	CO3	L2	1.7.1
OR						
7.		Explain different types of Authentication Systems.	10	CO4	L2	2.7.1
OR						
8.		What are the different classes of Computer Crimes? Give examples for each.	10	CO4	L2	2.7.1
OR						
9.	a	Explain different steps in Hackers Methodology.	5	CO5	L2	2.7.1
	b	What are the considerations that a cyber forensic analyst should follow to preserve the integrity of the evidence? List 5 rules of digital evidences	5	CO5	L2	2.7.1
10.		Compare computer forensics and cell phone forensics	10	CO5	L2	1.5.3
