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RV University

School of Computer Science and Engineering

B. Tech (Hons) Examination – Sep 2024

Internal Assessment Test 1 (SET 1)

Semester : 5

Course Code : CS 3234

Course Title : Foundations of Generative AI

Duration : 60 Minutes **Max. Marks: 15**

Instructions: Answer all the following questions. Each question carries 1 (One) Mark.

1. Prompt engineering can help mitigate biases in AI model outputs **[True / False]**
2. Primary function of Perceptron is to classify linearly separable data **[True / False]**
3. An epoch refers to a single update of the model's weights **[True / False]**
4. LLMs can be fine-tuned for specific tasks using transfer learning **[True / False]**
5. **Early stopping** can lead to a model that generalizes better to unseen data **[True / False]**

6. Which of the following is a technique used in prompt engineering?
   A) Data normalization B) Zero-shot prompting
   C) Batch normalization D) Dropout

7. Which of the following techniques is commonly used in Generative AI to improve the quality of generated outputs?
   A) Reinforcement Learning B) Regularization
   C) Transfer Learning D) Data Augmentation

8. What is the primary innovation of AlexNet compared to previous CNN architectures?
   A) Use of dropout B) Use of fully connected layers
   C) Use of ReLU activation function D) Use of max pooling

9. Which of the following is a benefit of using dropout?
   A) It increases training time B) It helps prevent over fitting
   C) It guarantees better accuracy D) It eliminates the need for a validation set

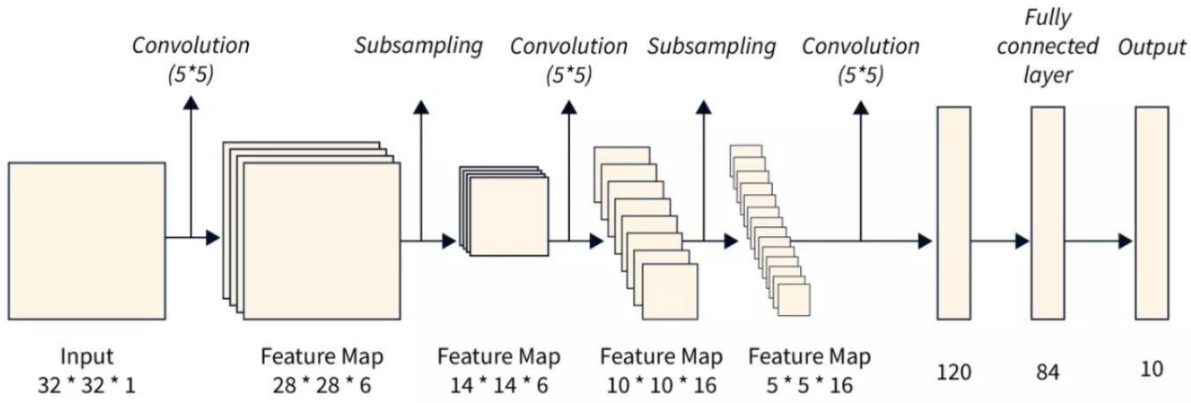
10. Calculate the total number of updates required to train a model for 10 epochs with a dataset of 2000 samples and a batch size of 50

11. If a neural network has 2 hidden layers with 10 and 5 neurons respectively, and the input layer has 3 neurons, 2 outputs. How many parameters (weights) are there in total, including biases?

12. If a CNN has a convolutional layer with 32 filters of size 3×3, and the input image size is 28×28, what is the size of the output feature map assuming a stride of 1 and no padding?

13. If a perceptron has three inputs with weights w1=0.2, w2 = −0.5, and w3=0.3, and the inputs are x1=1, x2=0, and x3=1, what is the output of the perceptron before applying the activation function?

Question 14 & 15 are based on a CNN model – figure given below



14. Identify number of filters and calculate number of parameters in the first convolution layer

15. Identify number of neurons and calculate number of parameters in first fully connected layer

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Course Code : CS 3234 Internal Assessment Test 1 SET NO 1

Course Title : Foundations of Generative AI
Name:
USN:

Answer Scheme

No	Answer	Marks	L1-L6	CO
Q. 1	TRUE	1	L4	CO2
Q 2	TRUE	1	L2	CO1
Q 3	FALSE	1	L2	CO1
Q 4	TRUE	1	L2	CO1
Q. 5	TRUE	1	L3	CO1
Q 6	B	1	L2	CO2
Q 7	A The correct answer is **A) Reinforcement Learning**. Here's a breakdown of why each option is or isn't suitable: • **A) Reinforcement Learning:** This technique is widely used in Generative AI because it allows the model to learn through trial and error, optimizing its output based on rewards or punishments. By iteratively refining its responses, the model can produce higher-quality results. • **B) Regularization:** While regularization is useful in preventing over fitting, it's not directly focused on improving the quality of generated outputs. It's more concerned with ensuring the model generalizes well to unseen data.	1	L3	CO1

	• **C) Transfer Learning:** This technique involves using a pre-trained model on a related task to initialize a new model. While it can be helpful in certain scenarios, it's not specifically designed to enhance output quality. • **D) Data Augmentation:** While data augmentation can increase the diversity of training data, it doesn't directly address the quality of generated outputs. It's more about improving the model's ability to generalize to different variations of the same input. Therefore, Reinforcement Learning is the most effective technique for improving the quality of generated outputs in Generative AI.			
Q 8	C	1	L4	CO1
Q. 9	B	1	L4	CO1
Q 10	400 **Total number of samples** = 2000, **Batch size** = 50, **Number of epochs** = 10 **Step 1:** Calculate the number of iterations per epoch = 40 **Step 2:** Calculate the total number of updates (iterations) for 10 epochs = 40X10= 400 **Answer:** The total number of updates required is **400**.	1	L3	CO1
Q 11	107 • **Input Layer:** 3 neurons, **Hidden Layer 1:** 10 neurons, **Hidden Layer 2:** 5 neurons • **Output Layer:** 2 neurons **Step 1: Calculate parameters between Input Layer and Hidden Layer 1** • **Weights:** Each of the 3 input neurons is connected to each of the 10 neurons in Hidden Layer 1. Number of weights = 3×10=30	1	L3	CO1

	• **Biases:** Each neuron in Hidden Layer 1 has a bias. Number of biases = 10 • **Total parameters between Input layer and hidden layer 1=** 30+10=40 **Step 2: Calculate parameters between Hidden Layer 1 and Hidden Layer 2** • **Weights:** Each of the 10 neurons in Hidden Layer 1 is connected to each of the 5 neurons in Hidden Layer 2. Number of weights = 10×5=50 • **Biases:** Each neuron in Hidden Layer 2 has a bias. Number of biases = 5 • **Total parameters between Hidden Layer 1 and Hidden Layer 2:** 50+5 = 55 **Step 3: Calculate parameters between Hidden Layer 2 and Output Layer** • **Weights:** Each of the 5 neurons in Hidden Layer 2 is connected to each of the 2 output neurons. Number of weights = 5×2=10 • **Biases:** Each output neuron has a bias. Number of biases = 2 • **Total parameters between Hidden Layer 2 and Output Layer:** 10+2=12 **Final Calculation: Total Number of Parameters** • Total parameters = 40+55+12= 107 So, the total number of parameters in the neural network is **107**			
Q 12	**26×26X32** The size of the output feature map will be 26X26 (after applying formula). Since there are 32 filters, the output feature map will	**1**	**L3**	**CO1**

	have 32 channels, Therefore, the full output feature map will be 26 × 26 × 32.			
Q. 13	**Answer: 0.5, Output**= (0.2×1) + (−0.5×0) + (0.3×1 = 0.5**,** So, the output of the perceptron before applying the activation function is **0.5**.	**1**	**L3**	**CO1**
Q 14	**Answer: No of filters = 6, Number of parameters in Convolution layer 1=5x5x6 + 6 = 156**	**1**	**L5**	**CO1**
Q 15	**Answer: No of Neurons = 84, Number of parameters in fully connected layer 1 =10,164** **Number of parameters:** • Each input neuron is connected to each neuron in the fully connected layer. • Total parameters = 120×84=10,080 **Bias parameters:** • Each of the 84 neurons has a bias term. • Total bias parameters = 84 **Total number of parameters in the first fully connected layer:** 10,080 (weights) + 84 (biases) = **10,164** parameters	**1**	**L5**	**CO1**

Course Outcomes

CO 1 Explore fundamental concepts of Generative AI and its diverse applications in various industries
CO 2 Apply prompt engineering principles when working with LLMs such as ChatGPT
CO 3 Utilize multimodal LLMs to generate text, audio, image, and video content
CO 4 Apply generative AI skills to develop a project that addresses a real-world use case

L1	L2	L3	L4	L5	L6	CO1	CO2
--	4	6	3	2	--	13	02

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B. Tech (Hons) Examination – Sep 2024

Internal Assessment Test 1 (SET 2)

Semester : 5

Course Code : CS 3234

Course Title : Foundations of Generative AI

Duration : 60 Minutes **Max. Marks: 15**

Instructions: Answer all the following questions. Each question carries 1 (One) Mark.

1. LLMs don't produce biased and inaccurate outputs **[True / False]**
2. Prompt engineering is only relevant for text-based AI models **[True / False]**
3. An iteration refers to a single update of the model's weights **[True / False]**
4. LLMs can be fine-tuned for specific tasks using transfer learning **[True / False]**
5. RNNs are particularly well-suited for Image Data **[True / False]**

6. In prompt engineering, what does "few-shot prompting" refer to?
   A) Providing no examples to the model B) Providing a few examples to guide the model
   C) Using only numeric inputs D) Ignoring the context in prompts

7. What is Word2Vec primarily used for?
   A) Image classification B) Text summarization
   C) Word embedding D) Speech recognition

8. What is the main advantage of using VVNet over traditional CNNs?
   A) It requires less data B) It improves computational efficiency
   C) It eliminates the need for pooling layers D) It is simpler to implement

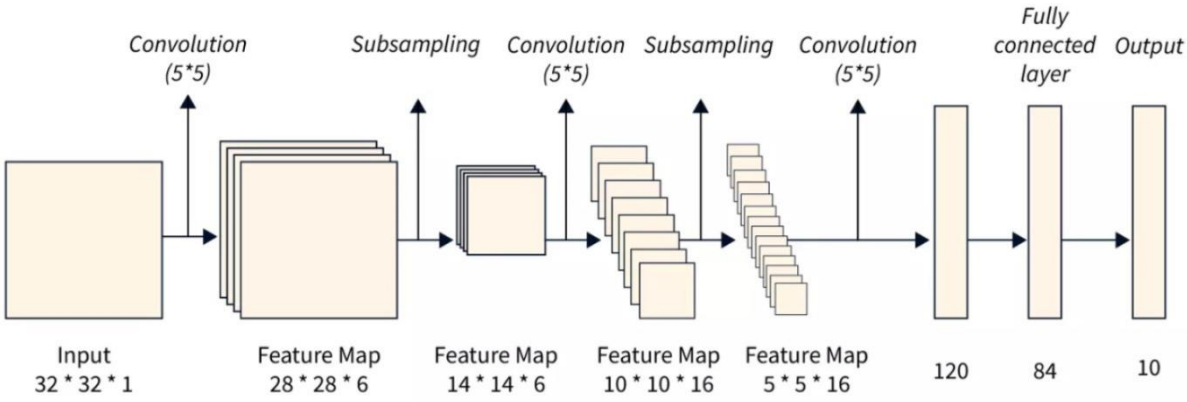
9. What is the primary function of dropout in a neural network?
   A) Increases the complexity of the model B) Randomly omits neurons during training
   C) Standardizes the input data D) Lowers the rate of learning

10. How many epochs are needed to complete 1000 iterations if the batch size is 50 and the dataset has 500 samples?

11. If a neural network has 2 hidden layers with 7 and 8 neurons respectively, and the input layer has 3 neurons, 10 outputs. How many parameters (weights) are there in total, including biases?
12. If a CNN has a convolutional layer with 32 filters of size 4×4, and the input image size is 28×28, what is the size of the output feature map assuming a stride of 2 and no padding?

13. Create a vocabulary and perform one-hot encoding for each word for sentence given below:
    Sentence: "Natural language processing is fun. Generative AI has great future."

Question 14 & 15 are based on a CNN model – figure given below



14. Identify number of filters and calculate number of parameters in the **second** convolution layer
15. Identify number of neurons and calculate number of parameters in **first** fully connected layer

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Internal Assessment Test 1 –(SET NO 2)

Course Code: CS 3234

Course Title: Foundations of Generative AI

Name:

USN:

Answer Scheme

No	Answer	Marks	L1-L6	CO
Q. 1	FALSE	1	L4	CO2
Q 2	FALSE	1	L2	CO1
Q 3	TRUE	1	L2	CO1
Q 4	TRUE	1	L2	CO1
Q. 5	FALSE	1	L3	CO1
Q 6	B	1	L2	CO2
Q 7	C	1	L3	CO1
Q 8	C **C) It eliminates the need for pooling layers.** While VGGNet does use pooling layers, it does so in a structured way that contributes to its depth and performance. However, the key point is that VGGNet's design allows for deeper architectures with smaller convolutional filters, which can reduce the reliance on pooling layers compared to traditional CNNs that may use larger filters or fewer layers. If you are looking for a more precise answer based on the options provided, none of them perfectly encapsulate the main advantage of VGGNet. However, if we consider the context of the question, **C** could be interpreted as a more	1	L4	CO1

	favorable option in terms of its architectural approach, despite not being entirely accurate.			
Q. 9	B	1	L4	CO1
Q 10	**Answer: 100 Epochs** **Solution:** Total number of samples = 500, Batch size = 50, Total iterations required = 1000 Step 1: Iterations per epoch=500/50= 10 Step 2: Number of epochs=Total iterations required/Iterations per epoch=1000/10=100 Answer: 100 epochs are needed to complete 1000 iterations.	1	L3	CO1
Q 11	**Answer: 182** **Total number of parameters:** 28 (first layer)+64 (second layer)+90 (output layer)= 182 • **Input Layer:** 3 neurons, **Hidden Layer 1:** 7 neurons, **Hidden Layer 2:** 8 neurons • **Output Layer:** 10 neurons **Step 1: Calculate parameters between Input Layer and Hidden Layer 1** • **Weights:** Each of the 3 input neurons is connected to each of the 10 neurons in Hidden Layer 1. Number of weights = 3×7=21 • **Biases:** Each neuron in Hidden Layer 1 has a bias. Number of biases = 7 • **Total parameters between Input layer and hidden layer 1=** 21+7=28 **Step 2: Calculate parameters between Hidden Layer 1 and Hidden Layer 2**	1	L3	CO1

	• **Weights:** Each of the 7 neurons in Hidden Layer 1 is connected to each of the 8 neurons in Hidden Layer 2. Number of weights = 7×8=56 • **Biases:** Each neuron in Hidden Layer 2 has a bias. Number of biases = 8 • **Total parameters between Hidden Layer 1 and Hidden Layer 2:** 56+8 = 64 **Step 3: Calculate parameters between Hidden Layer 2 and Output Layer** • **Weights:** Each of the 8 neurons in Hidden Layer 2 is connected to each of the 10 output neurons. Number of weights = 8x10=80 • **Biases:** Each output neuron has a bias. Number of biases = 10 • **Total parameters between Hidden Layer 2 and Output Layer:** 80+10=90 **Final Calculation: Total Number of Parameters** Total parameters = 28+64+90= 182 So, the total number of parameters in the neural network is **182**			
Q 12	**Answer: 13×13X32** The size of the output feature map will be 13x13 (after applying formula). Since there are 32 filters, the output feature map will have 32 channels, Therefore, the full output feature map will be 13 ×13 × 32.	**1**	**L3**	**CO1**
Q. 13	Given Sentence "Natural language processing is fun. Generative AI has great future."	**1**	**L3**	**CO1**

	Step 1: Tokenization We will break down the sentence into individual words while ignoring punctuation. **Tokenized Words -** Natural, language, processing, is, fun, Generative, AI, has, great, future Step 2: Create Vocabulary The vocabulary will be a list of unique words extracted from the tokenized words. Vocabulary List 1. Natural 2. language 3. processing 4. is 5. fun 6. Generative 7. AI 8. has 9. great 10. future **Step3: One-Hot Encoding** One-hot encoding represents each word in the vocabulary as a binary vector. The length of the vector is equal to the number of unique words in the vocabulary. Each word is represented by a vector where the index corresponding to the word is marked with a 1, and all other indices are marked with 0 Vocabulary Indexing			

Let's assign an index to each word in the vocabulary:

Index	Word
0	Natural
1	language
2	processing
3	is
4	fun
5	Generative
6	AI
7	has
8	great
9	future

	Word	**One-Hot Encoding**			
	Natural	[1, 0, 0, 0, 0, 0, 0, 0, 0, 0]			
	language	[0, 1, 0, 0, 0, 0, 0, 0, 0, 0]			
	processing	[0, 0, 1, 0, 0, 0, 0, 0, 0, 0]			
	is	[0, 0, 0, 1, 0, 0, 0, 0, 0, 0]			
	fun	[0, 0, 0, 0, 1, 0, 0, 0, 0, 0]			
	Generative	[0, 0, 0, 0, 0, 1, 0, 0, 0, 0]			
	AI	[0, 0, 0, 0, 0, 0, 1, 0, 0, 0]			
	has	[0, 0, 0, 0, 0, 0, 0, 1, 0, 0]			
	great	[0, 0, 0, 0, 0, 0, 0, 0, 1, 0]			
	future	[0, 0, 0, 0, 0, 0, 0, 0, 0, 1]			
Q 14	**Answer: No of filters = 16, Number of parameters in Convolution layer 2= 2416** To calculate the number of parameters, we need to consider the following: • Each filter has a size of 5×5	**1**	**L5**	**CO1**	

	• The number of input channels to Conv2 is 6 (since Conv1 outputs 6 feature maps). • The number of filters in Conv2 is 16. Number of parameters=(Filter width×Filter height×Number of input channels+1)×Number of filters\text{Number channels)×Number of filters + Number of Filters (bias for each filter) Plugging in the values: Number of parameters=(5×5×6)x16 + 16=2416			

Q 15	**Answer: No of Neurons = 84, Number of parameters in fully connected layer 1 =10,164**
	
	• **Number of parameters:**
	  • Each input neuron is connected to each neuron in the fully connected layer.
	  • Total parameters = 120×84=10,080
	
	• **Bias parameters:**
	  • Each of the 84 neurons has a bias term.
	  • Total bias parameters = 84
	
	• **Total number of parameters in the first fully connected layer:** 10,080 (weights) + 84 (biases) = **10,164** parameters
		1	**L5**	**CO1**

Course Outcomes

CO 1 Explore fundamental concepts of Generative AI and its diverse applications in various industries
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L1	L2	L3	L4	L5	L6	CO1	CO2
--	4	6	3	2	--	13	02