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| **Hall Ticket Number: 20CS702/PE**   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | | **IV/IV B.Tech (Regular) DEGREE EXAMINATION** | | | | | **January, 2024** | | **Computer Science & Engineering** | | | **Seventh Semester** | **Artificial Neural Networks and Deep Learning** | | | | **Time: Three Hours** | | | **Maximum:70 Marks** | |
| |  |  | | --- | --- | | ***Question 1 is compulsory*** | **(14X1 = 14 Marks)** | | ***Answer one question from each unit.*** | **(4X14=56 Marks)** | |  |  | |

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|  |  |  | **CO** | | **BL** | **M** |
| 1. | a) | What is the derivative of the sigmoid function | CO1 | | L2 | 1M |
|  | b) | How can the output of a Sigmoid neuron in the output layer be interpreted as? | CO1 | | L2 | 1M |
|  | c) | How many learnable parameters are there in 2 neurons input layer, 4 neurons hidden layer and 3 neurons output layer? | CO1 | | L3 | 1M |
|  | d) | Which factors govern the size of the resulting feature map after convolution? | CO2 | | L2 | 1M |
|  | e) | Which factor determines the number of feature maps output by a convolution layer? | CO2 | | L2 | 1M |
|  | f) | What is no. of kernels in a filter determined by? | CO2 | | L3 | 1M |
|  | g) | What is dropout and how does it work? | CO2 | | L2 | 1M |
|  | h) | How is an LSTM superior over a simple RNN? | CO3 | | L2 | 1M |
|  | i) | What are the different gates in an LSTM? | CO3 | | L2 | 1M |
|  | j) | What does cell state in a RNN contribute to? | CO3 | | L2 | 1M |
|  | k) | What is KL-divergence? | CO4 | | L4 | 1M |
|  | l) | What is the latent space representation in Variational Auto Encoders? | CO4 | | L3 | 1M |
|  | m) | What are the applications of autoencoders? | CO4 | | L2 | 1M |
|  | n) | When do you use Variational Auto Encoders? | CO4 | | L2 | 1M |
| **Unit –I** | | | | | | |
| 2. | a) | Derive the Gradient Descent update rule for the parameters between the hidden layer and the output layer and the biases in the output layer. | CO1 | | L3 | 7M |
|  | b) | How can the convergence of Gradient Descent algorithm in ANN be optimized in case of local minima and sparse input feature? Justify both the optimizers with elaboration. | CO1 | | L4 | 7M |
| **(OR)** | | | | | | |
| 3. | a) | Derive the stochastic and batch gradient descent weight update rules for sigmoid neuron. | CO1 | L3 | | 7M |
|  | b) | Code the sigmoid neuron model to train and test the Iris dataset. | CO1 | L3 | | 7M |
| **Unit –II** | | | | | | |
| 4. | a) | Analyze the principles of a CNN which reduce the complexity of a ANN. Justify with illustration of its structure, layers and a working example. | CO2 | L4 | | 7M |
|  | b) | Code the TensorFlow program for image classification with an in-built dataset. | CO2 | L3 | | 7M |
| **(OR)** | | | | | | |
| 5. | a) | Compute the resulting feature map values from the input [[2,4,1,0], [0,2,2,1],[2,1,0,1],[1,0,1,2]] by convolution with 2x2 kernel [[1,2],[2,1]] with a bias of 1 and stride of 2. | CO2 | | L3 | 7M |
|  | b) | Tabulate the output sizes and parameters with calculations for each layer in the following CNN model to classify 128x128x3 images with the layers:- Convolution with 4 filters, 2x2 max pooling, Convolution with 8 filters, 2x2 average pooling, Convolution with 16 filters, 2x2 max pooling, FC layer with 32 neurons, and output layer of 3 neurons. Choose 3x3 kernels and a stride of 1. | CO2 | | L3 | 7M |
| **Unit –III** | | | | | | |
| 6. | a) | How does the structure of a LSTM cell improve a RNN cell? Elaborate with the working details of different gates in LSTM cell. | CO3 | | L4 | 7M |
|  | b) | Write the TensorFlow code for text classification choosing a text dataset. | CO3 | | L3 | 7M |
| **(OR)** | | | | | | |
| 7. | a) | What are the computational steps and details in the working of skip-gram and continuous bag of words models? Expalin with examples to convert a word to vector? | CO3 | | L2 | 7M |
|  | b) | Explain the structure and working of a RNN cell. | CO3 | | L2 | 7M |
| **Unit –IV** | | | | | | |
| 8. | a) | Differentiate between sparse autoencoder and contractive encoder. Explain their architecture, training, and loss functions. | CO4 | | L2 | 7M |
|  | b) | Explain the principle, architecture, training and loss functions for simple autoencoder and denoising autoencoder. | CO4 | | L2 | 7M |
| **(OR)** | | | | | | |
| 9. | a) | Which model do you suggest for generating new samples? Explain its principle, architecture, training, and loss functions. | CO4 | | L4 | 7M |
|  | b) | Implement and explain the details of code for creating and training a simple autoencoder. | CO4 | | L3 | 7M |