4. (a) What do you understand by CNN ? Explain along with architecture and applications. (CO4)

   (b) (i) The input image has been converted into a matrix of size 232 × 232 and a kernel/filter of size 5 × 5 with a stride of 1 and no padding. What will be the size of the convoluted matrix ?

   (ii) Why do you think convolution layer has lesser number of parameters than fully connected layer ? Write appropriate reason. (CO4)

   (c) Write short notes on the following : (CO4)

   (i) RNN

   (ii) LSTM

5. (a) Explain Deep belief nets. (CO5)

   (b) Write deep learning applications in vision, speech, and natural language processing. (CO5)

   (c) What is generative model ? Explain Restrictive Boltzmann Machines. (CO5)

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TMC–402

M. C. A. (FOURTH SEMESTER)
END SEMESTER
EXAMINATION, May, 2023
DEEP LEARNING
Time : Three Hours
Maximum Marks : 100

Note : (i) All questions are compulsory.

(ii) Answer any *two* sub-questions among (a), (b) and (c) in each main question.

(iii) Total marks in each main question are **twenty**.

(iv) Each sub-question carries 10 marks.

1. (a) What is the main objective of gradient descent ? Explain in detail along with the challenges in gradient descent. (CO1)

   (b) Define computational graph. Explain its types along with suitable diagram in detail. (CO1)

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(c) (i) Which of the activation gives unbounded output for an unbounded input ? Write expression along with its graphical representation.

(ii) Calculate $\dfrac{df}{dx}$, where $f = |\,x\,|$ and $x \neq 0$. ($|\,x\,|$ means absolute value of x).   (CO1)

2. (a) What are the functional units of ANN for pattern recognition tasks ? Explain in detail.   (CO2)

(b) (i) Compute the output of a perceptron with three inputs and weight values 1, 2 and 3 (there is no threshold function). There is also a bias weight of – 0.5. The input is (1, 1, 1).

(ii) In a simple MLP model with 8 neurons in the input layer, 5 neurons in the hidden layer and 1 neuron in the output layer. What is the size of the weight matrices between : hidden and output layer and input and hidden layer ?

(iii) The number of nodes in the input layer is 10 and the hidden layer is 5. What will be the maximum number of connections from the input layer to the hidden layer ?   (CO2)

(c) Explain the working of perceptron with the help of mathematical expression in detail.   (CO2)

3. (a) (i) Which of the autoencoder uses corrupted versions of input ? Explain in detail.

(ii) Define that autoencoder which strictly has fewer hidden neurons than the input neurons ?   (CO3)

(b) Write and explain the concept of Back propagation learning in detail with mathematical expressions.   (CO3)

(c) What do you understand by Greedy layerwise training in Deep neural networks.   (CO3)