# Nirma University

## Institute of Technology

Semester End Examination (IR), December - 2018

B. Tech. in Computer Engineering / Information Technology, Semester-VII

IT7F4 Deep Learning

Roll / Exam No. [ ]     Supervisor's initial with date [ ]

Time: 3 Hours                                                      Max. Marks: 100

Instructions:
1. Attempt all questions of Section I and II separately in same Answerbook.
2. Figures to right indicate full marks.
3. Draw neat sketches wherever necessary.
4. Assume suitable data wherever applicable and clearly mention them.

### Section I

Q 1    Answer the following:                                                      [18]
(a)    Discuss these terms with respect to convolutional layer:    [6]
       Local Connectivity, Receptive Field and Parameter Sharing
(b)    Consider the feed forward neural network given below    [12]
       which consists of one hidden layer in addition to the input
       and output layers:
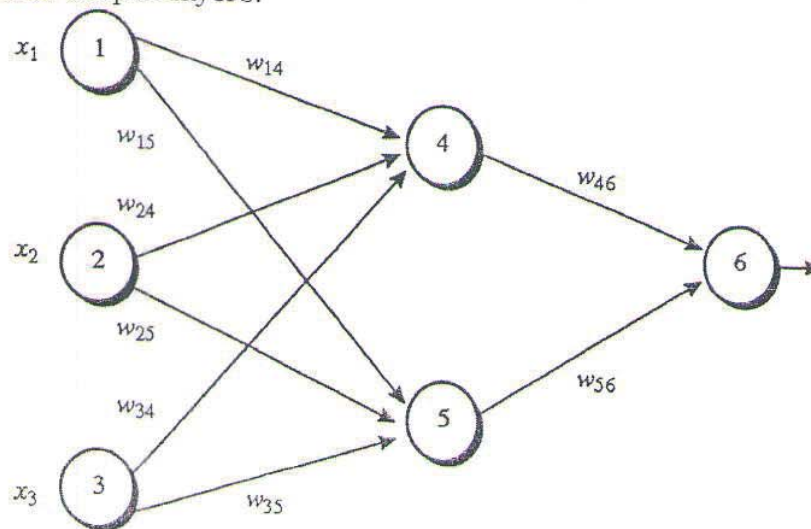


Neurons 4, 5 and 6 also have bias connections denoted as
$b_4$, $b_5$ and $b_6$ respectively. Assume $O_i$ as the actual output
of the $i^{th}$ neuron in hidden and output layers and $T_6$ as the
target for neuron 6. $Net_i$ is the net input of neurons in
hidden and output layers. Activation function for neurons
4, 5 and 6 is log-sigmoid. Let mean square error be the cost
function. Derive equations for updating all biases and
weights using gradient descent.

Q 2    Salient parts in the image can have extremely large    [16]
       variation in size. This can cause problem in classification
       or recognition. How is this problem handled in Inception

v1? What is the problem with naïve inception module? How is this problem addressed? What was the role of auxiliary classifiers in inception v1? Discuss in details.

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| Q 3 | | Answer the following: | [16] |
| | (a) | Discuss LSTM and GRU with necessary diagrams and equations. What do they improve upon simple RNN? | [12] |

**OR**

| | | | |
|---|---|---|---|
| | (a) | Describe how RNN can be used for machine translation. | [12] |
| | (b) | Which benefits do one should look for when using Transfer Learning? | [4] |

## Section II

| | | | |
|---|---|---|---|
| Q 4 | | Answer the following: | [18] |
| | (a) | How can one achieve domain adaptation by backpropagation? Discuss in detail. | [10] |
| | (b) | Describe nearest neighbours, bed of nails, max unpooling and transpose convolution for upsampling. | [8] |
| Q 5 | | Discuss YOLO algorithm for object detection in details. Also, clearly discuss role of non max suppression and anchor boxes. | [14] |

**OR**

| | | | |
|---|---|---|---|
| Q 5 | | What are autoencoders? Write pseudocode for vanilla, multilayer, convolutional, sparse and denosing autoencoders. Explain their strengths and weaknesses. | [14] |
| Q 6 | | Answer the following: | [18] |
| | (a) | Discuss contrastive divergence update rule at length. | [6] |
| | (b) | Explain sliding window approach for sematic segmentation. What is its limitation? Describe fully convolutional approach for semantic segmentation. | [12] |