

**Dept. of CSE, IIT Jodhpur**  
**ML-2 : Minor-1**  
**November 01, 2020 (11 AM to 12:10 PM IST)**

1. This is an open-book/internet exam. If you take help (help  $\neq$  copy) from any source, please cite it appropriately. If you copy a solution from anywhere/anyone (without/with minor changes), it will be considered as a case of plagiarism and a severe penalty will be awarded to everyone involved.
2. Answer all the questions precisely; verbosity will be penalized.
3. No marks will be awarded without proper explanation/justification at each step.
4. No queries will be answered during the exam; please make appropriate assumption(s) and proceed.
5. There will be a penalty of 5% per minute for late submissions.

[60 Minutes (+ 10 minutes for uploading)]

[120 Marks]

1. How does putting a constraint on the norm of the parameters help in controlling overfitting? What will happen if we don't consider this constraint in our cost function? Briefly discuss. [10]
2. True/False: "Cost function is always non-negative." Justify your answer. [10]
3. True/False: "Gradient descent helps in regularization." Justify your answer. [10]
4. Briefly discuss how the cross-entropy loss function is related to the notion of "entropy" in Science. [10]
5. True/False: "Bias/variance tradeoff is linked with convergence." Justify your answer. [10]
6. True/False: "We can use a CNN inside an RNN." Justify your answer. [10]
7. Provide an intuitive explanation of how drop-out helps in regularization. [10]
8. Suppose we perform both batch normalization and dropout while training our network. Discuss how these will affect each other. [10]
9. Suppose our prediction rule is given by  $\hat{y} = \max(\tanh(wx + b), 0.01)$ , where  $w$  is a learnable parameter,  $x$  is an input and  $b$  is a constant bias. Assuming that we have  $M$  samples in our training set, calculate/derive the first-order derivative of the binary cross-entropy loss. [10]
10. Comment on the feasibility of a "fully-connected convolution layer". [10]
11. "Flowers and Leaves" is a bedsheet printing company. Some of the issues that happen while printing are:
  - (a) Folding of some portion of bedsheet, due to which that portion remains unprinted.
  - (b) Some colour does not get printed as per the expected pattern due to which that portion of bedsheet does not look good.
  - (c) Some portion of bedsheet is torn.

The company wants to automate the process of identifying all of the above issues by using an ML-based system, and approaches you for it. Discuss your solution. [20]