*Total No. of Questions: 6* *Total No. of Printed Pages:3*

**Enrollment No.....**

# Faculty of Science
## End Sem Examination May-2024
### BC3CO60 Deep Learning

Programme: B.Sc. Branch/Specialisation: Computer Science / All

**Duration: 3 Hrs.** **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. What is the primary purpose of a Recurrent Neural Network (RNN)? **1**

(a) Image classification (b) Text generation
(c) Reinforcement learning (d) Object detection

ii. What is the purpose of the peephole connections in a Long Short-Term Memory (LSTM) network? **1**

(a) To allow the cell state to influence the gating mechanisms
(b) To adjust the learning rate during training
(c) To introduce non-linearity to the network
(d) None of these

iii. The self-organizing list improves the efficiency of _____. **1**

(a) Binary search (b) Jump search
(c) Sublist search (d) Linear search

iv. The worst-case running time of a linear search on the self-organizing list is _____. **1**

(a) O(1) (b) O(logn) (c) O(n) (d) $O(n^2)$

v. Select the correct option. **1**

I. Supervised learning methods include autoencoders.
II. The output and input of the autoencoder are identical.

(a) Both the statements are TRUE.
(b) Statement I is TRUE, but statement II is FALSE.
(c) Statement I is FALSE, but statement II is TRUE.
(d) Both the statements are FALSE.

vi. Autoencoders are trained using _____. **1**
(a) Feed Forward (b) Reconstruction
(c) Back Propagation (d) They do not require Training

vii. What should be the aim of training procedure in boltzman machine of feedback networks? **1**
(a) To capture inputs
(b) To feedback the captured outputs
(c) To capture the behaviour of system
(d) None of these

viii. By using which method, boltzman machine reduces effect of additional stable states? **1**
(a) No such method exist (b) Simulated annealing
(c) Hopfield reduction (d) None of these

ix. What is the primary objective of a Generative Adversarial Network (GAN)? **1**
(a) Image classification (b) Image generation
(c) Text summarization (d) Text translation

x. What are the two main components of a GAN? **1**
(a) Generator and encoder
(b) Discriminator and encoder
(c) Generator and discriminator
(d) Encoder and discriminator

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|---|---|---|---|
| Q.2 | i. | What are difference between RNN & LSTM? | **3** |
| | ii. | Explain Training RNNs with back propagation with suitable example. | **7** |
| OR | iii. | Write short notes on:<br>(a) Hessian free optimization<br>(b) LSTM variations & evaluating | **7** |
| Q.3 | i. | What you mean Self-Organizing maps? | **2** |
| | ii. | What are the five stages in self-organising map? | **8** |
| OR | iii. | How to evaluating and improving of SOMs? Explain some application of SOMs. | **8** |



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|---|---|---|---|
| Q.4 | i. | What is Auto encoder? | **3** |
| | ii. | How to build an Auto-encoder? Explain De-noising auto-encoders. | **7** |
| OR | iii. | What are stacked auto-encoders? Explain applications of auto encoders. | **7** |
| Q.5 | i. | Explain Energy-Based Models (EBM). | **4** |
| | ii. | What are differences between Restricted Boltzmann Machine and Deep Boltzmann machines? | **6** |
| OR | iii. | Write a note on applications of Boltzmann Machines. | **6** |
| Q.6 | | Write short note on any two: | |
| | i. | Explain the architecture of GANs. | **5** |
| | ii. | Image creation with GANs | **5** |
| | iii. | Applications of GANs. | **5** |

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# Marking Scheme
# Deep Learning-BC3CO60(T)

Q.1 i) (b) Text generation **1**

ii) (a) To allow the cell state to influence the gating mechanisms **1**

iii) (d) Explanation: Linear search in a linked list has time complexity O(n). To improve the efficiency of the linear search the self organizing list is used. A self-organizing list improves the efficiency of linear search by moving more frequently accessed elements towards the head of the list. **1**

iv) (c) **1**
Explanation: Worst case occurs when the element is located at the very end of list. So n comparisons must be made to the locate element. So the worst case running time of linear search on self organizing list is O(n).

v) (d)Both the statements are FALSE. **1**
Simple input of the raw input data is all that is required to train an autoencoder. Since they don't require specific labels to train on, autoencoders are thought of as an unsupervised learning technique. The fact that they create their own labels from the training data, however, makes them self-supervised.
The autoencoder will produce an output that is near to the input but not an exact replica of it. They are not the best option if lossless compression is what you seek.

vi) (c) Back Propagation **1**
A popular algorithm for training feedforward neural networks is backpropagation. Instead of crudely computing the gradient with respect to each individual weight, it efficiently computes the gradient of the loss function with respect to the network weights. Gradient methods, including variations like gradient descent or stochastic gradient descent, are frequently used to train multi-layer networks and update weights to reduce loss due to this efficiency.
In order to avoid duplicating computation of intermediate terms in the chain rule, the backpropagation method calculates the gradient of the loss function with respect to each weight using the chain rule, layer by layer, and iterating backward from the last layer

vii) (d) none of the mentioned **1**
Explanation: The training procedure should try to capture the pattern environment.

viii) (b) simulated annealing **1**
Explanation: boltzman machine uses simulated annealing to reduce the effect of additional stable states.

ix) (b) Image generation **1**

x) (c) Generator and discriminator **1**

Q.2 i. 3-3 difference between RNN & LSTM---------- **3 marks**

ii. Explain Training RNNs with back propagation with suitable example…….. **7 marks**

OR iii. (a) Hessian free optimization----------**3**$^{1/2 \text{ marks}}$
(b) (b) LSTM variations & Evaluating---------**3**$^{1/2 \text{ marks}}$

Q.3 i. Definition----------2 marks

ii. five stages in self Organising map----------8 marks

OR iii. Evaluating and Improving of SOMs----------4 marks
Explain some Application of SOMs.----------4 marks

Q.4 i. Auto encoder----------3 marks

ii. building an Auto-encoder----------4 marks
De-noising auto-encoders----------3 marks

OR iii. stacked auto-encoders----------3 marks
applications of auto encoders.----------4 marks

Q.5 i. EBM----------4 marks

ii. 5-5 differences between Restricted Boltzmann -----6 marks
Machine and Deep Boltzmann machines?

OR iii. applications of Boltzmann Machines----------6 marks

Q.6

i. Explain the architecture of GANs. ----------5 marks

ii. Image creation with GANs----------5 marks

iii. Applications of GANs. ----------5 marks

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