UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Deep Learning
Program: M. Tech. (Automation and Robotics Engineering)
Course Code: ECER7004P

Semester: II
Time: 03 hrs.
Max. Marks: 100

Instructions: Attempt all the questions

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	(a) How the deep learning network is different from ANN? (i) Advance computing power (ii) Automatic feature extraction (iii) Complex structure (iv) All of these (b) Which activation function in neural network is differential? (i) Threshold (ii) ReLU (ii) Sigmoid (iv) All of these (c) Which neural network has only one hidden layer between the input and output? (i) Shallow neural network (ii) Deep neural network (iii) Recurrent neural network (iv) Feedforward neural network (d) What is hebb's rule of learning (i) the system learns from its past mistakes (ii) the system recalls previous reference inputs & respective ideal outputs (iii) the strength of neural connection get modified if it is fired repeatedly (iv) none of the mentioned	4M	CO1
Q 2	(a) _____ is a tool which is used to reduce the dimension of data. (i) principal component analysis (ii) product component analysis (iii) pre complex analysis (iv) none of these (b) _____ basically known as characteristic roots which measures the variance in all variables. (i) eigen value (ii) eigen vector (iii) complex values (iv) none of these (c) Which of the following are the applications of PCA? (i) Face recognition (ii) Speech recognition (iii) Noise filtering (iv) All of these (d) PCA reduces the dimension by finding a few_____ linear combinations. (i) Hexagonal (ii) Orthogonal (iii) Octagonal (iv) Pentagonal	4M	CO2

Q 3	(a) Which of the following network is well suited for image recognition problem. (i) feedforward neural network (ii) recurrent neural network (iii) convolutional neural network (iv) none of these (b) Which of the following are the advantages of batch normalization? (i) good accuracy (ii) reduces the need of other regularization (iii) faster convergence (iv) all of these (c) In recurrent neural network machine translation is which type of problem? (i) one to one (ii) many to one (iii) one to many (iv) many to many (d) Which convolutional neural network architecture uses sigmoidal activation function and average pooling? (i) LeNet (ii) AlexNet (iii) VGG (iv) Network in Network	**4M**	**CO3**
Q 4	Write the steps involved to design multi-layer neural network in python programming language.	**4M**	**CO4**
Q 5	Elucidate the significance of following in convolutional neural network: (a) Padding (b) Stride	**4M**	**CO3**

SECTION B
(4Qx10M= 40 Marks)

Q 6	(a) What are the significant parameters which affects the operation of artificial neural network. Differentiate error correction learning and memory-based learning. (b) Explain how artificial neural network is inspired from biological neural network. With suitable diagram explain the structure of artificial neuron.	**10M**	**CO1**
Q 7	Explain how data compression is performed in artificial neural network? Briefly explain all the steps that are involved in principal component analysis with a suitable example.	**10M**	**CO2**
Q 8	Differentiate the following modern CNN architectures: (a) VGG and Network in Network (b) AlexNet and GoogleNet **OR** What are the advantages of convolution neural network over artificial neural network? With suitable diagram explain the architecture of convolution neural network.	**10M**	**CO3**
Q 9	What do you understand by Triplet loss function? Explain how face recognition and face verification can be implemented using convolutional neural network with a suitable flow chart.	**10M**	**CO4**

SECTION C
(2Qx20M=40 Marks)

Q 10	(a) What is unconstrained optimization technique in neural network? Differentiate how weights of neural network are optimized using Newton's method and Gauss newton method. (b) Design and explain the following neural network architecture: (i) Multi-layer neural network	**20M**	**CO1**

	(ii) Recurrent neural network **OR** (a) What is the significance of activation function in neural network? Explain with suitable diagram any four activation function which are widely used in designing neural network. (b) What is a perceptron? Derive the expression of weight change in a multi-layer neural network using back-propagation algorithm.		
Q 11	(a) What are autoregressive models? Design and explain different types of recurrent neural network. (b) Explain the following modern recurrent neural network with suitable diagram: (i) Gated Recurrent Unit (ii) Long Short Term Network	**20M**	**CO3**