

**M.Sc. SEMESTER - II/M.C.A. SEMESTER - II/M.C.A SEMESTER - IV
EXAMINATION 2020-21**

COMPUTER SCIENCE/COMPUTER APPLICATIONS

CS - 307/CS - 321/CS - 307 T : Artificial Neural Networks

Time : 4.30 hours

Max. Marks : 70

Instructions

1. The Question Paper contains 08 questions out of which you are required to answer any 04 questions. The question paper is of 70 marks with each question carrying 17.5 marks.

प्रश्नपत्र में आठ प्रश्न पूँछे गये हैं जिनमें से 4 प्रश्नों का उत्तर देना है। प्रश्नपत्र 70 अंकों का है, जिसमें प्रत्येक प्रश्न 17.5 अंक का है।

2. The total duration of the examination will be **4.30 hours** (Four hours and thirty minutes), which includes the time for downloading the question paper from the Portal, writing the answers by hand and uploading the hand-written answer sheets on the portal.

परीक्षा का कुल समय 4.30 घंटे का है जिसमें प्रश्नपत्र को पोर्टल से डाउनलोड करके पुनः हस्तलिखित प्रश्नों का उत्तर पोर्टल पर अपलोड करना है।

3. For the students with benchmark disability as per Persons with Disability Act, the total duration of examination shall be **6 hours** (six hours) to complete the examination process, which includes the time for downloading the question paper from the Portal, writing the answers by hand and uploading the hand-written answer sheets on the portal.

दिव्यांग छात्रों के लिये परीक्षा का समय 6 घंटे निर्धारित है जिसमें प्रश्नपत्र को पोर्टल से डाउनलोड करना एवं हस्तलिखित उत्तर को पोर्टल पर अपलोड करना है।

4. Answers should be hand-written on a plain white A4 size paper using black or blue pen. Each question can be answered in upto 350 words on 3 (Three) plain A4 size paper (only one side is to be used).

हस्तलिखित प्रश्नों का उत्तर सादे सफेद A4 साइज के पन्ने पर काले अथवा नीले कलम से लिखा होना चाहिये। प्रत्येक प्रश्न का उत्तर 350 शब्दों तक तीन सादे पृष्ठ A4 साइज में होना चाहिये। प्रश्नों के उत्तर के लिए केवल एक तरफ के पृष्ठ का ही उपयोग किया जाना चाहिए।

5. Answers to each question should start from a fresh page. All pages are required to be numbered. You should write your Course Name, Semester, Examination Roll Number, Paper Code, Paper title, Date and Time of Examination on the first sheet used for answers.

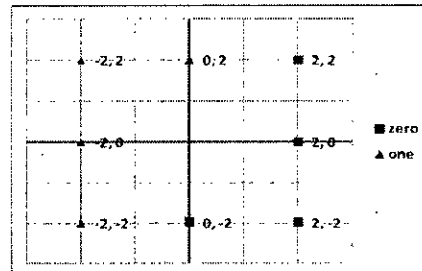
प्रत्येक प्रश्न का उत्तर नये पृष्ठ से शुरू करना है। सभी पृष्ठों को पृष्ठांकित करना है। छात्र को प्रथम पृष्ठ पर प्रश्नपत्र का विषय, सेमेस्टर, परीक्षा अनुक्रमांक, प्रश्नपत्र कोड, प्रश्नपत्र का शीर्षक, दिनांक एवं समय लिखना है।

Questions

(2)

Questions

- 1 a) Describe the structure of biological neuron with functionality of its different parts 8
b) Explain the Action Potential curve, and how it propagates in unidirectional only. 5.5
c) Distinguish between electrical synapse and chemical synapse. What type of synapse is present in the human brain? 4
- 2 a) Explain the Learning Process in the context of neural networks, and Hebbian Learning Rule 6
b) Explain the types of activation function and name the functions that can be used for following models:
i. Binary output 0/1 model
ii. Binary output +1/-1 model 6
iii. Real number output values from 0 to 1 model
iv. Real number output values from -1 to +1 MODEL
c) Explain the advantage of using a +1/-1 model over a 0/1 model for activation values 5.5
- 3 a. Distinguish between the Feed-forward networks and the Recurrent networks with suitable examples. 6
b. How Associative memory can be implemented using Hopfield networks? Explain with a simple example. 6
c. Prove that the Hopfield networks with weights $T_{ij}=T_{ji}$ will always converge to a stable state. 5.5
- 4 a) Explain the functional limitation of perceptron and what is the cause for it? 5.5
b) Design and implement perceptron network to perform simple logic function: AND gate. 6
c) Solve the classification problem which is shown in the figure given below by drawing a decision boundary. Find the weight and bias values the result in single-neuron Perceptron with the chosen decision boundary.

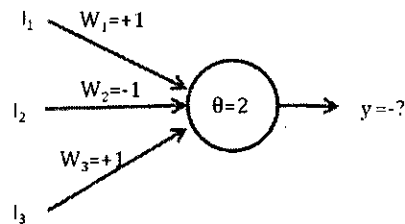


- 5 (a) Explain the competitive learning including the different methods of selecting the winning unit. 7.5
(b) Describe the architecture of Kohonen Feature Map and explain its training. 10
- 6 (a) How does the RBF neuron differ from back propagation hidden-layer neuron? 5.5
(b) Explain the Learning Process of Radial Basis Function Neural Networks. 12

P.T.O.

(3)

- 7 a) Explain the forward and backward steps in back-propagation networks training. 12
b) Explain the role of bias units 5.5
- 8 a) Describe a neural network solution model for any one of the following: 12
i. Time series forecasting
ii. Traveling salesperson problem
- b) Consider the following McCulloch-Pitts neuron. 5.5



Find the value of y for the following inputs

- i. $I_1=0, I_2=0, I_3=1$
ii. $I_1=1, I_2=0, I_3=0$
iii. $I_1=1, I_2=0, I_3=1$
iv. $I_1=1, I_2=1, I_3=1$
