


Name:			
Enrolment No:			
<b>UPES</b> <b>End Semester Examination, May 2023</b>			
<b>Course: Modelling, AI and Machine Learning</b> <b>Program: M. Tech. (ARE)</b> <b>Course Code: ECEG7032</b>		<b>Semester: II</b> <b>Time : 03 hrs.</b> <b>Max. Marks: 100</b>	
<b>Instructions: Attempt all the Questions</b>			
<b>SECTION A</b> <b>(5Qx4M=20Marks)</b>			
S. No.		Marks	CO
Q 1	(a) Which game playing program developed by DeepMind beat the world's best chess-playing computer program. (i) BetaZero (ii) DeltaZero (iii) GammaZero (iv) AlphaZero (b) Which scientist first coined the term artificial intelligence? (i) Alan Turing (ii) Marie Curie (iii) John McCarthy (iv) None of these (c) Which of the following platform implements the Python code on Cloud Server? (i) Spyder (ii) Google Colab (iii) Jupyter (iv) None of These (d) Which of the following industry developed ChatGPT? (i) Microsoft (ii) AWS (iii) OpenAI (iv) Oracle	4	CO1
Q 2	(a) Which search is similar to minimax search? (i) Hill-climbing search (ii) Depth-first search (iii) Breadth-first search (iv) All of the mentioned (b) The term _____ is used for a depth-first search that chooses values for one variable at a time and returns when a variable has no legal values left to assign. (i) Forward search (ii) Backtrack search (iii) Hill algorithm (iv) Reverse-Down-Hill search (c) Which search technique is the combination of depth first search and breadth first search technique? (i) Best first search (ii) MIN-MAX algorithm (iii) AO* algorithm (iv) None of these (d) MIN-MAX algorithm uses which algorithm for exploration of the complete game tree? (i) Depth first search (ii) Breadth first search (iii) Best first search (iv) None of these	4	CO2
Q 3	(a) Which of the following represents the first order logic form of the following statement? <b>“Mahesh lives in white house”</b>	4	CO3

	<p>(i) lives (Mahesh, house) <math>\wedge</math> color (house, white)  (ii) lives (Mahesh, house) <math>\vee</math> color (house, white)  (iii) lives (house, Mahesh) <math>\vee</math> color (house, white)  (iv) lives (house, Mahesh) <math>\wedge</math> color (house, white)</p> <p>(b) Which of the following is the example of ATRANS?  (i) Listen (ii) Tell (iii) Give (iv) Decide</p> <p>(c) First order logic uses predicate which involves  (i) Constants (ii) Variables (iii) Functions (iv) All of these</p> <p>(d) Which knowledge representation describes sequence of events?  (i) Frames (ii) Scripts (iii) Semantic Network (iv) First order logic</p>		
Q 4	<p>(a) Which of the following are the unsupervised machine learning algorithm?  (i) Decision Trees (ii) Random Forest (iii) SVM (iv) Hierarchical Clustering</p> <p>(b) In SVM, _____ functions take low-dimensional input space and transform it to a higher dimensional space.  (i) Kernel (ii) Vector (iii) Support Vector (iv) Hyper Plane</p> <p>(c) Which algorithm is also known as ensemble classifier?  (i) Decision Tree (ii) Random Forest (iii) SVM (iv) kNN</p> <p>(d) What library contains the machine learning algorithms in Python.  (i) Pandas (ii) Numpy (iii) Pylab (iv) Sklearn</p>	4	CO4
Q 5	<p>(a) Why do we need biological neural networks?  (i) to solve tasks like machine vision &amp; natural language processing  (ii) to apply heuristic search methods to find solutions of problem  (iii) to make smart human interactive &amp; user-friendly system  (iv) all of the above</p> <p>(b) Which of the following statements is true when you use <math>1 \times 1</math> convolutions in a CNN?  (i) It can help in dimensionality reduction (ii) It can be used for feature pooling (iii) It suffers less overfitting due to small kernel size (iv) All of the above</p> <p>(c) Which modern CNN model utilizes multiple size kernels?  (i) LeNet (ii) AlexNet (iii) GoogleNet (iv) VGG</p> <p>(d) In convolutional neural network which layer reduces the dimension of feature map while preserving the important information.  (i) Pooling layer (ii) Convolutional layer (iii) Fully connected layer (iv) None of these</p>	4	CO5
<b>SECTION B</b> <b>(4Qx10M= 40 Marks)</b>			
Q 6	<p>Differentiate the following search techniques:  (i) Depth first search and Breadth first search algorithm  (ii) A* and AO* algorithm</p>	10	CO2
Q 7	<p>Explain the concept of resolution in predicate logic. Consider the following facts:  (a) John likes all kinds of pets.</p>	10	CO3

	<p>(b) Dogs are pets.  (c) Cats are pets.  (d) Any animal anyone owns and is not killed is a pet.  (e) Reji owns a goat and is still alive.  (f) Vinod owns everything Reji owns.</p> <p>(i) Translate the facts into formulae in predicate logic.  (ii) Convert the formulae into clausal form.  (iii) Prove that Jack likes goats using resolution</p>																																																																			
Q 8	How unsupervised learning is different from supervised learning? Explain with a suitable example. What is clustering in unsupervised learning? Briefly explain any two clustering techniques.	10	CO4																																																																	
Q 9	<p>Differentiate the following modern CNN architectures:  (a) LeNet and AlexNet  (b) VGG and GoogleNet</p> <p style="text-align: center;"><b>OR</b></p> <p>What do you understand by batch normalization? Explain how it is implemented in fully connected layers and convolution layers. With suitable diagram explain the architecture of GoogleNet.</p>	10	CO5																																																																	
<b>SECTION-C</b> <b>(2Qx20M=40 Marks)</b>																																																																				
Q 10	<p>(a) Global Technology Solutions (GTS), a leading provider of IT solutions, is coming to College of Engineering and Management for hiring B. Tech. students. Last year data set of shortlisted students is given as follows. It is to evaluate that Chandra, a student of CEM, wants to find out if he may be offered a job in GTS. His CGPA is high, Communication is Bad, Aptitude-High, Programming skills-Bad.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>CGPA</th> <th>Communication</th> <th>Aptitude</th> <th>Programming Skills</th> <th>Job Offered?</th> </tr> </thead> <tbody> <tr><td>High</td><td>Good</td><td>High</td><td>Good</td><td>Yes</td></tr> <tr><td>Medium</td><td>Good</td><td>High</td><td>Good</td><td>Yes</td></tr> <tr><td>Low</td><td>Bad</td><td>Low</td><td>Good</td><td>No</td></tr> <tr><td>Low</td><td>Good</td><td>Low</td><td>Bad</td><td>No</td></tr> <tr><td>High</td><td>Good</td><td>High</td><td>Bad</td><td>Yes</td></tr> <tr><td>High</td><td>Good</td><td>High</td><td>Good</td><td>Yes</td></tr> <tr><td>Medium</td><td>Bad</td><td>Low</td><td>Bad</td><td>No</td></tr> <tr><td>Medium</td><td>Bad</td><td>Low</td><td>Good</td><td>No</td></tr> <tr><td>High</td><td>Bad</td><td>High</td><td>Good</td><td>Yes</td></tr> <tr><td>Medium</td><td>Good</td><td>High</td><td>Good</td><td>Yes</td></tr> <tr><td>Low</td><td>Bad</td><td>High</td><td>Bad</td><td>No</td></tr> <tr><td>Low</td><td>Bad</td><td>High</td><td>Bad</td><td>No</td></tr> </tbody> </table> <p>(b) A college professor believes that if the grade for internal examination is high in a class, the grade for external examination will also be high. A random sample of 15 students in that class was selected, and the data is given below:</p>	CGPA	Communication	Aptitude	Programming Skills	Job Offered?	High	Good	High	Good	Yes	Medium	Good	High	Good	Yes	Low	Bad	Low	Good	No	Low	Good	Low	Bad	No	High	Good	High	Bad	Yes	High	Good	High	Good	Yes	Medium	Bad	Low	Bad	No	Medium	Bad	Low	Good	No	High	Bad	High	Good	Yes	Medium	Good	High	Good	Yes	Low	Bad	High	Bad	No	Low	Bad	High	Bad	No	[15+5]	CO4
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Internal marks	External marks
15	33
22	34
18	41
15	45
21	56
25	67
26	42
27	62
14	55
22	68

Use ordinary least square (OLS) algorithm and obtain the regression line.

Q 11	<p>(a) What do you understand by McCulloch-Pitts Model of a Neuron? Explain how it can be used to implement logical operations.</p> <p>(b) Explain and derive how synaptic weights are optimized in multi-layer neural network using backpropagation algorithm with a suitable diagram.</p> <p style="text-align: center;"><b>OR</b></p> <p>What is unconstrained optimization technique in neural network? Differentiate how weights of neural network are optimized using Newton's method and Gauss newton method.</p>	<b>[10+10]</b>	<b>CO5</b>
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