



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Supplementary Examination, Dec 2023

Course: Introduction to Artificial Intelligence
Program: B Tech AI & ML
Course Code: CSAI 2007
Instructions: Attempts all questions.

Semester: III
Time: 03 hours
Max. Marks: 100

SECTION A
(Scan and Upload)

(5Qx 4M = 20 Marks)

| | | | |
|----|--|----------|------------|
| Q1 | Define Artificial Intelligence (AI). Differentiate between strong AI and Weak AI. | 4 | CO1 |
| Q2 | Let x stands for the proposition “I bought a lottery ticket” and y for “I won the jackpot”. Express the following as natural English sentences: (a) $\neg x$ (b) $x \wedge y$ | 4 | CO2 |
| Q3 | Consider the following list of variables and identify the types of random variables. (a) Class size. (b) Distance from airport to railway station. (c) Number of delegates meeting attended. (d) Number of patients arriving at a hospital in a day. | 4 | CO3 |
| Q4 | Differentiate biological neurons and artificial neural networks. | 4 | CO3 |
| Q5 | Write the four major steps involved in the machine learning process. | 4 | CO4 |

SECTION B
(Scan and upload)

(4Qx10M = 40 Marks)

| | | | |
|----|--|-----------|------------|
| Q6 | Show the following are a tautology. (a) $(p \rightarrow q) \leftrightarrow (\neg q \rightarrow \neg p)$ (b) $[p \wedge (p \rightarrow q)] \rightarrow q$ | 10 | CO3 |
| Q7 | (a) Draw an architectural diagram of the McCulloch-Pitts neuron model. Discuss the power and limitations of networks of McCulloch-Pitts neurons. (b) The input to a single-input neuron is 2.0, its weight is 2.3, and its bias is -3. It has a linear transfer function. i. What is the net input to the transfer function? | 10 | CO3 |

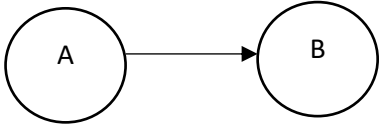
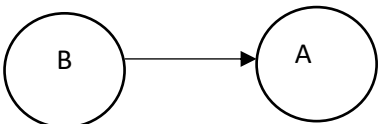
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|----|---|----|-----|
| | ii. What is the neuron output? | | |
| Q8 | (a) State the process of usability of the cross-validation technique in a machine learning algorithm. (b) How do you evaluate a machine learning algorithm using k-fold cross-validation on a dataset? Explain with example. | 10 | CO4 |
| Q9 | The following data represents the number of hours 5 different students watched television during the weekend and the scores of each student who took a test the following Monday. 1. Find the equation of the regression line. 2. Use the equation to find the expected test score for a student who watches 5 hours of TV. | 10 | CO4 |

| | | | | | |
|--------------------------|----|----|----|----|---|
| Hours, x | 2 | 3 | 4 | 4 | 5 |
| Mid-term test score, y | 25 | 20 | 15 | 10 | 5 |

OR

Explain the process of tree splitting in binary classification tree algorithm. How does the tree determine which variable to break at the root node and which at its child nodes?

SECTION-C
(Scan and upload)
(2Qx 20M= 40 Marks)

| | | | |
|-----|--|----|-----|
| Q10 | Define the Knowledge base. Discuss components of the Knowledge-based system. How the knowledge base plays its role in developing the expert system? Explain with an example. OR Discuss the Wumpus world problem in artificial intelligence and its rules for inference. | 20 | CO2 |
| Q11 | Consider the following Bayesian network, where A = having the flu and B= coughing: <div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 20px;">$P(A)=0.1$</div> <div style="text-align: center;">  </div> <div style="margin-left: 20px;"> $P(B A)=0.8$ $P(B \neg A)=0.3$ </div> </div> (a) Write down the joint probability table specified by the Bayesian network. [10] (b) Determine the probabilities for the following Bayesian network. [10] <div style="text-align: center; margin-top: 20px;">  </div> | 20 | CO3 |