Name:.....
Roll No:.....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS),

KOTHAMANGALAM - 686666

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.TECH SECOND SERIES EXAMINATION, OCTOBER 2026 (S7 AIML)

AIT 401 FOUNDATIONS OF DEEP LEARNING

Max. Marks: 40 Duration: 1.5 Hours

PART A

Answer all questions. Each question carries 3 marks.

1. A CNN is designed for classifying 64 × 64 × 3 RGB images. The architecture consists of the following layers:(i) Convolution Layer 1: 16 filters of size 3 × 3, stride = 1 and padding = 1. Each filter has one bias term.(ii) Max Pooling Layer 1: 2 × 2 pooling with stride = 2.(iii) Convolution Layer 2: 32 filters of size 5 × 5, stride = 1 and padding = 2. Each filter has one bias term.The output of the third convolution layer is connected to a fully connected layer with 128 neurons and then to an output layer with 10 neurons.Compute the dimensions of the feature map after each convolution and pooling layer and the total number of trainable parameters in the network. (CO3)
2. Compare any four pretrained convolutional architectures and discuss how each model addressed the limitations of prior architectures. (CO3)
3. Explain the concept of unrolling an RNN through time for a sequence of length T = 4 and show how the recurrent connections are transformed into a sequence of computational blocks. (CO4)
4. Explain the major steps involved in developing an LSTM-based weather forecasting system, starting from weather-data preprocessing and sequence formation up to the prediction of the next-day temperature. (CO4)

PART B

Answer all questions. Each question carries 14 marks.

5. Explain the architectures of Long Short-Term Memory and Gated Recurrent Unit. Compare and contrast LSTM and GRU in terms of their design, memory capabilities, and advantages.
6. A single-layer RNN employs the tanh activation function and the output unit employs a linear activation function. The weights are initially set to $W_{xh} = 0.3, W_{hh} = 0.5 \quad and \quad W_{hy} = 0.8$. The RNN processes the two-step input sequence

$$(x_1, x_2) = (1.0, 0.4)$$

with corresponding target outputs

$$(y_1^*, y_2^*) = (0.6, 0.9)$$

Perform Backpropagation through time to update the weights.

(CO4)

VISION

To mould competent computing professionals, innovators, and leaders guided by ethical values and committed to technological advancement and sustainable societal development.

MISSION

- Provide quality education through strong theoretical foundations, experiential learning, and exposure to emerging computing technologies.
- Cultivate critical thinking, research aptitude, and innovation through problem-based learning, industry interaction, and research initiatives.
- Foster ethical values, leadership, social responsibility, and an aspiration for lifelong learning through professional practices, teamwork, and mentoring.