

Enrolment No: E22CSEU0821 Name of Student: MADHAN

 Department/ School: SSET
**END-TERM EXAMINATION, ODD SEMESTER DECEMBER 2024**
**COURSE CODE:** CSET225  
**COURSE NAME:** Intelligent Model Design using AI  
**PROGRAM:** B.Tech.

**MAX. DURATION:** 3 HRS  
**TOTAL MARKS:** 40

Mapping of Questions to Course and Program Outcomes											
Q. No.	A1	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4
CO	2	2	1	3	2	3	1	3	1	3	1
PO	1,5,7,8	1,5,7,8	1-3,5,10	1,3,5,8,10	1,5,7,8	1,3,5,8,10	1-3,5,10	1,3,5,8,10	1-3,5,10	1,3,5,8,10	1-3,5,10
BTL	2	3	2	4	2	3	2	3	4	3	2

**GENERAL INSTRUCTIONS: -**

- Do not write anything on the question paper except **name, enrolment number and department/school**.
- Carrying mobile phones, smartwatches and any other non-permissible materials in the examination hall is an act of UFM.

**COURSE INSTRUCTIONS:**

- Write your Batch and Group clearly at the top of the first page of your answer sheet.
- All questions are compulsory in Section A.
- Section B: Attempt any 5 out of the 6 questions.
- Section C: Attempt any 3 out of the 4 questions.

**SECTION A**
**A1) Choose the correct answer (only one option is correct). [10Q x 1Mark = 10 Marks]**

- What is the primary purpose of skip connections in the U-Net architecture?
  - To increase the number of layers in the network
  - To prevent overfitting by reducing parameters
  - To combine feature maps from the encoder and decoder, preserving spatial information
  - To reduce computation time by skipping certain layers
- Assess which factor is most critical for reducing bias in AI models used in IoT applications.
  - Increasing the model's complexity
  - Ensuring diverse and representative training data
  - Using the latest algorithms only

- D. Shortening the model training time
3. What is the purpose of the activation function in an artificial neural network?
- A. To store the network's learned weights
  - B. To introduce non-linearity into the network
  - C. To add more layers to the network
  - D. To initialize network weights
4. Which component in the transformer architecture is primarily responsible for capturing relationships between different parts of the input data?
- A. Convolutional layers
  - B. Self-attention mechanism
  - C. Pooling layers
  - D. Dropout layers
5. An adversarial attack that involves modifying inputs to cause incorrect model predictions is called:
- A. Poisoning attack
  - B. Extraction attack
  - C. Evasion attack
  - D. Data augmentation attack
6. Dilated convolutions in a CNN are particularly useful for which type of application?
- A. Text classification
  - B. Language translation
  - C. Image segmentation
  - D. Time-series prediction
7. How does the architecture of an LSTM help in overcoming the vanishing gradient problem?
- A. By using shallow layers in the network
  - B. Using gates that regulate the flow of information
  - C. By using random initialization of weights
  - D. By reducing the number of units in the hidden layer
8. What is the primary difference between LSTM and GRU architectures?
- A. GRU uses more gates than LSTM
  - B. LSTM uses memory cells and gates while GRU uses only gates
  - C. LSTM is more computationally efficient than GRU
  - D. GRU can process larger sequences than LSTM
9. Which of the following is the primary objective of time series analysis?
- A. To classify data
  - B. To identify patterns and forecast future values

- C. To reduce the dimensionality of data  
D. To cluster similar data points
10. Which technique is used to separate a time series into its underlying components such as trend, seasonality, and residuals?
- A. Principal Component Analysis  
B. Time series decomposition  
C. K-means clustering  
D. Data augmentation

### SECTION B

[5Q × 3 Marks = 15 Marks]

- B1) What are Large Language Models (LLMs), and how are they typically trained? Describe one key application of LLMs, highlighting why they are particularly suited to this task. [1+1+1 = 3 Marks]
- B2) What is Explainable AI. Why is it important for machine learning models? [1.5+1.5 = 3 Marks]
- B3) What is a Dilated Convolutional Neural Network? If a 10x10 matrix is convolved with a 3x3 filter, calculate the output size for dilation rates of 2, and 3. [1+2 = 3 Marks]
- B4) Explain the architecture of a Recurrent Neural Network (RNN). Describe the processes of forward propagation and backward propagation through time. [1+2 = 3 Marks]
- B5) Explain the Epoch and batch size. A model is trained for 5 epochs on a dataset with 50,000 samples using a batch size of 500. How many total iterations are required for training? [2+1 = 3 Marks]
- B6) What are the different types of activation functions in machine learning, and what are their specific uses? [3 Marks]

### SECTION C

[3Q × 5 Marks = 15 Marks]

- C1) Describe the architecture of a Vision Transformer. Explain the role of patching, linear embedding and positional encoding. Given an input image of size 224x224, calculate the number of patches if patch size of 16x16. [2+2+1 = 5 Marks]
- C2) Compare Gated Recurrent Units (GRU) with Long Short-Term Memory (LSTM) networks. Explain the different gates in an LSTM network. [3+2 = 5 Marks]
- C3) A CNN architecture is given. The input image is (32,32,1). Provide the output shapes for each layer in the architecture, assuming there is no padding. Also, write the total number of parameters. [5 Marks]

Layer Type	Layer Details	Output Shape	Number of Parameters
Convolutional	Conv2D (8 filters, 5x5)	(28, 28, 8)	208
Convolutional	Conv2D (16 filters, 3x3)	(26, 26, 16)	1168
Max Pooling	MaxPooling2D (2x2)	(13, 13, 16)	0
Flatten	Flatten	2704	0
Dense	Dense (256 units)	256	692224



**C4)** Explain the process of decomposing a time series into its trend, seasonal, and residual components. Discuss the potential applications of time series analysis in real-world scenarios such as finance, weather forecasting, or healthcare.

**[3+2 = 5 Marks]**