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Internal Assessment Test 2 – Jan 2026

Sub:	Introduction to AI and Applications					Sub Code:	1BAIA103	Branch:	ECE	
Date:	08/01/26	Duration:	90 min	Max Marks:	50	Sem/Sec:	I / M,N,O,P		OBE	
Answer any FIVE FULL Questions								MARKS	CO's	RBT
1 a	Discuss the basic neural network model and evaluate the function of its individual layers							5	CO4	L2
1 b	Explain the four steps to create Decision Trees with suitable example for each step..							5	CO2	L2
2	What is expert system? Explain three components of expert system.							10	CO5	L2
3	Explain how Machine Learning, Deep Learning, and Natural Language Processing techniques can be applied to solve real-world problems in Artificial Intelligence.							10	CO5	L3
4	Summarize the features of: (i) Reinforcement Learning (ii) Support Vector Machines (SVM)							10	CO3	L3
5a	What is No-Code AI. Explain why No-Code AI Must be Used?							5	CO3	L2
5b	What is the role of AI in Medical Diagnosis? Identify three applications of AI in Medical Diagnosis.							5	CO3	L3

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6	List different types of Robots. Identify and explain industry application of Robots..	10	CO5	L3
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1.Discuss the basic neural network model and evaluate the function of its individual layers

A neural network isa type of AI that works like the human brain. It helps machines learn patterns from data and make decisions or predictions.

2.Thinkof it as a group of connected “neurons” (nodes) that pass information to each other to understand complex data.

3.Nodes (Neurons):

a.Each node is like a tiny decision-maker.

b.It takes input, processes it, and passes output to the next node.

c.Example: Imagine a neuron receives information about the weather (sunny, rainy) and helps decide whether to carry an umbrella.

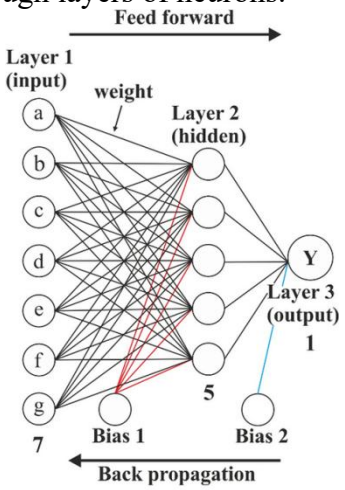
Introduction to Neural Networks:

Neural Networks (NN) are inspired by the human brain and consist of layers of interconnectedneurons.

Key Concept: Neurons process input data and learn to make predictions or classifications based onthe patterns they detect.

Training: The neural network adjusts its internal structure (called weights) to minimize errorsduring training.

Example: Think of recognizing a dog in an image; the neural network learns to identify featureslike shapes, edges, and colors by processing the image through layers of neurons.



ANN architecture : 7 - 5 - 1

Steps in Training a Neural Network: 1. 2. 3. 4.

1.b Explain the four steps to create Decision Trees with suitable example for each steps

Steps to Build a Decision Tree: 1.

Select a Feature to Split:

The first decision is to select the feature that best separates the data into different classes (e.g., Age,Salary, etc.).

Split the Data:

Split the data based on the chosen feature, creating two or more sub-nodes. Each sub-noderepresents a further division of the data.

Repeat:

Continue splitting the data at each node using the most relevant feature until the data cannot bedivided further or a stopping criterion is met.

Assign Class to Each Leaf:
Once the tree reaches a leaf node, assign the class based on the majority class of the data at that leaf.

2 Machine Learning Model - Classification Techniques

2. Decision Trees

Example of Decision Tree:

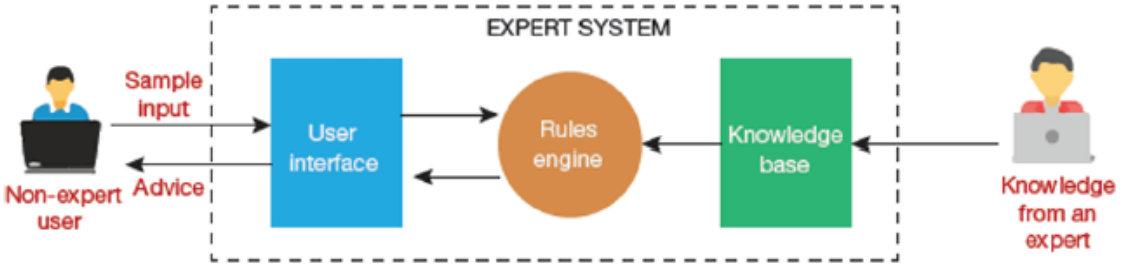
- Task: Predict whether a person will buy a product based on age and income.
- Step 1: Root Node: Split based on Age.
  - If Age > 40, predict Yes (Person C).
  - If Age <= 40, go to the next node.
- Step 2: Decision Node: Split based on Income for people aged <= 40.
  - If Income > 40K, predict Yes (Person A).
  - If Income <= 40K, predict No (Person B).
  - Leaf Nodes: The leaf nodes at the end of each branch contain the predictions ("Yes" or "No").

Person	Age	Income	Bought Product
A	30	50K	Yes
B	22	30K	No
C	45	70K	Yes
D	60	20K	No

2. What is expert system and its components?,

9.1 Expert System

- A computer program designed to solve complex problems with human-like expertise.
- Used to assist, not replace, human decision-making in specific domains (e.g., medicine, science).
- Key Components:
  a. User Interface: Allows interaction with the system.
  b. Knowledge Base (KB): Stores expert knowledge for decision-making.
  c. Inference Engine: Applies reasoning rules to extract knowledge and provide decisions.
- How it Works:
  - Expert systems analyze user queries.
  - Extract knowledge from the knowledge base.
  - Use reasoning and inference rules to generate results.



3. Explain how Machine Learning, Deep Learning, and Natural Language Processing techniques can be applied to solve real-world problems in Artificial Intelligence

1. Machine Learning (ML) Applications
Machine Learning focuses on allowing systems to learn from historical data and improve their performance over time without being explicitly programmed. ML algorithms identify patterns and make predictions or decisions.

Real-World Applications of ML:
1. Healthcare:
ML models analyze medical records to predict diseases such as diabetes, cancer, or heart disorders.
ML also supports personalized treatment plans and drug discovery.
2. Finance:
Banks use ML for fraud detection by identifying unusual transaction patterns.
Credit scoring models help decide loan approvals based on risk assessment.

3. Retail and E-Commerce:
ML-based recommendation engines suggest products based on customer behavior.
Demand forecasting helps companies maintain inventory efficiently
4. Transportation:
ML helps predict traffic patterns and optimize routes.
Ride-sharing apps like Uber use ML for price estimation and driver allocation.
5. Agriculture:
ML helps detect crop diseases and estimate crop yield.
Machine Learning makes decision-making faster, more accurate, and automated in many real-life sectors.
2. Deep Learning (DL) Applications
Deep Learning is a specialized subset of Machine Learning that uses multi-layered artificial neural networks to learn from massive amounts of data. Deep Learning excels in processing complex and unstructured data such as images, audio, and video.

Real-World Applications of DL:
1. Computer Vision:
DL models perform image classification, object detection, face recognition, and medical imaging analysis.
Used in security surveillance systems, photo tagging applications, and diagnostic tools.
2. Speech and Voice Recognition:

Virtual assistants like Siri, Alexa, and Google Assistant rely on DL for understanding voice commands.
DL converts speech to text with high accuracy.
3. Autonomous Vehicles:
Self-driving cars use DL to recognize lanes, pedestrians, traffic signs, and obstacles.
Helps make real-time driving decisions.
4. Robotics:
DL enables robots to understand environments and perform tasks such as object manipulation and navigation.
5. Entertainment:
Platforms like YouTube and Netflix use DL to provide personalized content recommendations.
3. Deep Learning significantly improves accuracy and performance in AI systems due to its ability to learn high-level features automatically.

3. Natural Language Processing (NLP) Applications
Natural Language Processing deals with the interaction between humans and machines using human languages such as English, Hindi, Tamil, etc. NLP allows computers to understand, process, and generate language.
Real-World Applications of NLP:
1. Chatbots and Virtual Assistants:
Chatbots in customer service use NLP to understand user queries and respond appropriately.
AI models like ChatGPT generate human-like responses.
2. Machine Translation:
Tools like Google Translate convert text from one language to another using NLP techniques.
3. Sentiment Analysis:
4. NLP analyzes opinions from social media posts, customer reviews, and surveys.

Used by companies to study customer satisfaction.
4. Text Summarization and Extraction:
NLP summarizes long articles or extracts important points automatically.
5. Email Filtering and Spam Detection:
NLP identifies spam emails by analyzing the content and patterns.

6. Healthcare Applications:
NLP reads medical reports and extracts useful information to support diagnosis.
5. Through NLP, machines can understand and work with human language, making communication between humans and computers more natural.

Summarize the features of:
(i) Reinforcement Learning
(ii) Support Vector Machines (SVM)
(i)Reinforcement Learning is a learning method where an agent learns how to act in an environment by performing actions and receiving feedback in the form of rewards or penalties.
Key Features:
1. Agent–Environment Interaction:
The RL model consists of an agent that interacts with an environment through actions.
2. Reward-Based Learning:
Every action taken by the agent results in a reward (positive) or penalty (negative).
4. The goal is to maximize the total reward.

3. Trial-and-Error Method:
The agent learns the best strategies by trying various actions repeatedly.
4. Exploration vs. Exploitation:
Exploration: Trying new actions to discover better rewards.
Exploitation: Using actions already known to give high rewards.
Balancing both is important in RL.
5. 5. Policy Learning:

RL learns a policy, which is a mapping from states to actions that produces the highest long-term reward.
6. Applications:
Game playing (Chess, Go, Atari games)
Robotics
Self-driving cars
Smart resource management

(ii) Support Vector Machines (SVM)
Support Vector Machines are supervised ML models used for classification and regression tasks.
Features of SVM:
6. 1. Margin Maximization:

SVM finds the best decision boundary (hyperplane) that separates classes by maximizing the margin between them.
2. Effective in High-Dimensional Spaces:
Works well even when the number of features is large compared to the number of samples
3. Kernel Trick:
SVM can handle non-linear data using kernel functions such as polynomial, sigmoid, and RBF kernels.
4. Robust and Accurate:
Provides high accuracy, avoids overfitting in many cases, and works well for complex datasets.
5. Versatile:
Used in classification, regression, and outlier detection.
6. Applications:
Face recognition
Text classification
7. Bioinformatics (gene classification)

5a. What is No-Code AI. Explain why No-Code AI Must be Used?

No Code AI

No-code AI refers to tools that enable individuals to build applications and systems without writing extensive code, relying instead on visual interfaces and guided user actions. These tools are often pre- integrated with others for seamless information exchange.

Applications Built with No-Code Tools:

● Websites and landing pages (e.g., Web flow).
● Web or mobile applications (e.g., Bubble, Adalo, Mendix, Thunkable).
● Databases (e.g., Airtable).
● Chatbots or virtual assistants (e.g., Octane AI, Kore.ai, Landbot, mindsay).
● Connecting tool stacks (e.g., Zapier, tray.io, Integromat, Parabola, Paragon).
● E-commerce platforms (e.g., Shopify, Weebly). • Membership management (e.g., Memberstack).
● Newsletters (e.g., Mailchimp, Mailjet).

Why No-Code AI is Beneficial:

● Enables automation through plug-and-play or drag-and-drop user interfaces.
● Allows users with no coding skills to utilise AI algorithms for business problems.
● Helps businesses build AI systems without significant time and resource investment.
● Increases accessibility of data science and AI for small and mid-sized companies.
● Enhances usability, allowing non-technical users to create AI solutions cost-effectively and quickly.
● Provides solutions of good quality and reduces human errors in system setup.
● Examples include Google AutoML, which facilitates training high-quality ML models tailored to business needs.

Categorisation of No-Code AI Tools by Technology:

● Computer Vision: For machines to obtain and act on information from digital images, videos, and PDFs.

● NLP (Natural Language Processing): For machines to understand and process spoken and written language, such as text messages. • Predictive Analytics: For predictive modelling based on structured (tabular) data, like predicting churn rates or stock prices.

5b What is the role of AI in Medical Diagnosis? Identify three applications of AI in Medical Diagnosis.

Artificial Intelligence (AI) plays a crucial role in medical diagnosis by analyzing vast datasets of medical images, patient records, and lab results.

Role of AI in Medical Diagnosis

AI algorithms, particularly deep learning, enhance diagnostic accuracy and speed. They are used to:

● Analyze medical imaging (X-rays, CTs, MRIs) to automatically detect subtle anomalies like tumors or fractures with high precision, often exceeding human capability.
● Identify complex patterns in patient data to predict disease risk or progression, aiding in early detection of conditions such as cancer and neurological disorders.
● Assist clinicians by providing rapid, data-driven insights, streamlining workflows, and reducing the cognitive burden, enabling doctors to make faster, more informed decisions. This collaborative approach improves patient outcomes.

AI is rapidly enhancing medical diagnosis through the application of advanced pattern recognition across large, complex datasets.

Three Key Applications of AI in Medical Diagnosis

● Radiology and Medical Imaging Analysis: AI models, particularly deep learning networks, are trained on vast numbers of medical images (X-rays, CTs, MRIs). They rapidly detect subtle, visually complex findings like lung nodules (early cancer), fractures, or diabetic retinopathy in retinal scans, often serving as a highly precise "second opinion" for human radiologists.
● Digital Pathology: In this field, AI analyzes digitized tissue samples (whole-slide images) with extreme precision. It's used to automatically identify, count, and grade cancer cells in biopsies, helping pathologists determine the aggressiveness of a tumor (e.g., Gleason scores for prostate cancer) and improving the speed and objectivity of cancer diagnosis.

● Electrocardiogram (ECG) Interpretation: AI algorithms analyze the electrical signals of the heart recorded by an ECG to detect patterns indicative of arrhythmias (irregular heartbeats), structural heart disease, or even predicting the risk of future events like a stroke. This is often faster and more consistent than traditional analysis, allowing for earlier intervention.

6. List different types of Robots. Identify and explain industry application of Robots..
8.3.3 Types of Robots 1.
Pre-Programmed Robots:
Perform simple, repetitive tasks in controlled environments.
Example: Robots on automotive assembly lines.
Humanoid Robots:
Mimic human behavior and actions (e.g., walking, carrying objects).
Example: Sophia by Hanson Robotics.

Autonomous Robots:
Operate independently without human intervention.
Examples: Roomba vacuum, autonomous drones, medical assistant bots.

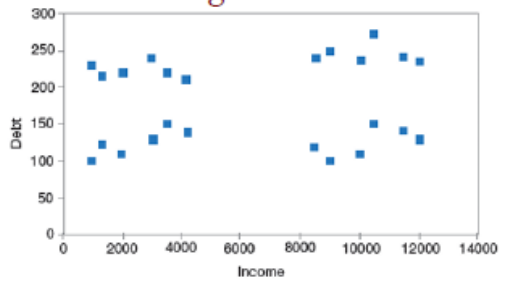
Teleoperated Robots:
Semi-autonomous robots controlled remotely by humans.
Example: Drones used for landmine detection or fixing underwater pipe leaks.

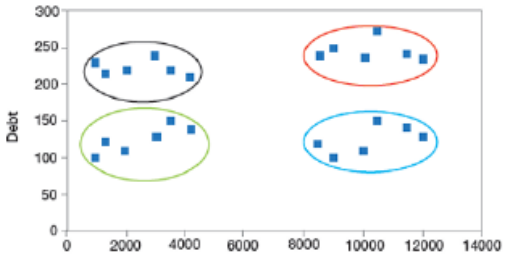
Augmenting Robots (VR Robots):
Enhance human abilities, like robotic prosthetics or exoskeletons.

Types of Robots Based on Degree of Human Control
Independent Robots:
Operate autonomously to replace humans in dangerous or mundane tasks.
Example: Bomb disposal robots, deep-sea exploration robots.
Dependent Robots:
Require human interaction or guidance.
Example: Prosthetic limbs controlled by human signals.
Chatbots:Software robots that simulate conversation and are commonly used in customer service.
Visibility GraphVisibility Graph: Connects visible vertices in the environment to form a path, finding the shortest routewhile avoiding obstacles.
Voronoi Diagram Voronoi Diagram: Maximizes the distance between the robot and obstacles, helping in safe path planning.
Cell Decomposition Path Planning
1.Exact Cell Decomposition: Divides the environment into cells and checks for free space.
2.Approximate Cell Decomposition: Uses fixed grid sizes for simpler and faster path planning, though it may miss narrow passageways.
Potential Field Path Planning
Potential Field: Uses forces to guide the robot to its goal, similar to gravity, with attractive forces for the goal and repulsive forces for obstacles.

7. Discuss the K-Means clustering algorithm and critically analyze its merits and demerits in real-world applications

5. K-Means Algorithm





K-Means is a popular unsupervised learning algorithm used for clustering. It groups data into k clusters where each cluster contains data points that are more similar to each other than to those in other clusters.

How K-Means Works:
1.Choose the Number of Clusters (k):
a.First, decide how many clusters you want (k). For example, k = 3.
2.Initialize Centroids:
a.Randomly pick k points in the dataset as the initial centroids (the center of each cluster).
3.Assign Points to Clusters:
a.For each data point, calculate the Euclidean distance from each centroid and assign the point to the nearest centroid.
4.Update Centroids:
a.After all points are assigned to clusters, recalculate the centroid of each cluster by finding the mean of all the points in that cluster.
5.Repeat
a.Repeat the process of assigning points to clusters and updating the centroids until the centroids stop changing (convergence is achieved).
Pros of K-M ean s Algorithm: 1.

Simple and Fast: Easy to implement and runs efficiently.

Scalable: Works well with large datasets.

Works Well for Spherical Clusters: Performs best when clusters are circular/spherical.

Needs Predefined 'k': The number of clusters (k) must be specified in advance.

Sensitive to Outliers: Outliers can distort the centroids.

Random Initialization: The final clusters can vary based on the initial centroids.

Non-Optimal for Non-Spherical Clusters: Struggles with clusters of different shapes or densities.
Cons of K-Means Algorithm: 1.
Ex a mple Use Case: Imagine you work in marketing for an e-commerce store, and you have a da taset of customer purchases. By using K-Means clustering, you could group customers based on their buying hab its (e.g., high spenders vs. low spenders), and then tailor marketing campaigns for each group.