SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

QUESTION BANK

V SEMESTER

1922504-ARTIFICIAL INTELLIGENCE BASED EMBEDDED SYSTEMS

Regulation – 2019

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QUESTION BANK

SUBJECT   : 1922504 - Artificial Intelligence Based Embedded System

SEM / YEAR: V Sem/ III Year

| **UNIT I INTRODUCTION** |
| Concept of AI, History, Current Status, Scope, Agents, Environments, Problem Formulations, Review of Tree and Graph Structures, State Space Representation, Search Graph and Search Tree. | | | |
| **PART – A** | | | |
Q.No.	**Questions**	**BT Level**	**Competence**
1	Define Artificial Intelligence.	BTL1	Remembering
2	List the categories of Artificial Intelligence.	BTL1	Remembering
3	State the scope of Artificial Intelligence.	BTL1	Remembering
4	What are the types of environments in which the agent acts?	BTL1	Remembering
5	List the properties of Binary Search Tree.	BTL1	Remembering
6	Define Agent. List out its types.	BTL1	Remembering
7	Enlist the five components to formulate a problem.	BTL2	Understanding
8	Give the various problem formulation methods.	BTL2	Understanding
9	Interpret the need for Turing Test.	BTL2	Understanding
10	Give the various components of Learning Agent.	BTL2	Understanding
11	Mention the short history of Artificial Intelligence.	BTL2	Understanding
12	Sketch the general form of the Binary Trees.	BTL3	Applying
13	Discover the Current status of Artificial Intelligence.	BTL3	Applying
14	Show the definition of state-space search technique.	BTL3	Applying
15	Determine the various types of graphs.	BTL3	Applying
16	Compare Tree and Graph Structures.	BTL4	Analyzing
17	Categorize the various types of Agent Architectures.	BTL4	Analyzing
18	Analyze Degree, In-degree and Out-degree with an example.	BTL4	Analyzing
19	Infer the different types of Tree Traversal Algorithms.	BTL4	Analyzing
20	Appraise the problem formulation for automated taxi driver agent.	BTL5	Evaluating
21	Assess the Role of an Agent Program.	BTL5	Evaluating
22	Evaluate the application domains of Artificial Intelligence.	BTL5	Evaluating
23	Construct the State space for representing Vacuum Cleaner agent.	BTL6	Creating
24	Write the ways to formulate a problem.	BTL6	Creating
**PART – B**			
1	Describe about the categories of Definitions of AI. (13)	BTL1	Remembering
2	List and explain the various Tree Traversal algorithms. (13)	BTL1	Remembering
3	Discuss about the Scope of Artificial Intelligence. (13)	BTL1	Remembering
4	Write Short notes on the following. (i) History of Artificial Intelligence (7) (ii) Current Trends of Artificial Intelligence (6)	BTL1	Remembering
5	Illustrate some of the Recent Application domains where AI plays critical role in 2022. (13)	BTL2	Understanding
6	Discuss about the basic terminologies of Tree structures. (13)	BTL2	Understanding
7	Interpret the operation and application of Learning Agents. (13)	BTL2	Understanding
8	Differentiate between Human (Natural Intelligence) and Machine (Artificial Intelligence). (13)	BTL2	Understanding
9	(i)Illustrate the basic terminologies of Graph Structure. (7) (ii)Differentiate between Tree and Graph Structures. (6)	BTL3	Applying
10	Illustrate Graph Structure and its types. (13)	BTL3	Applying

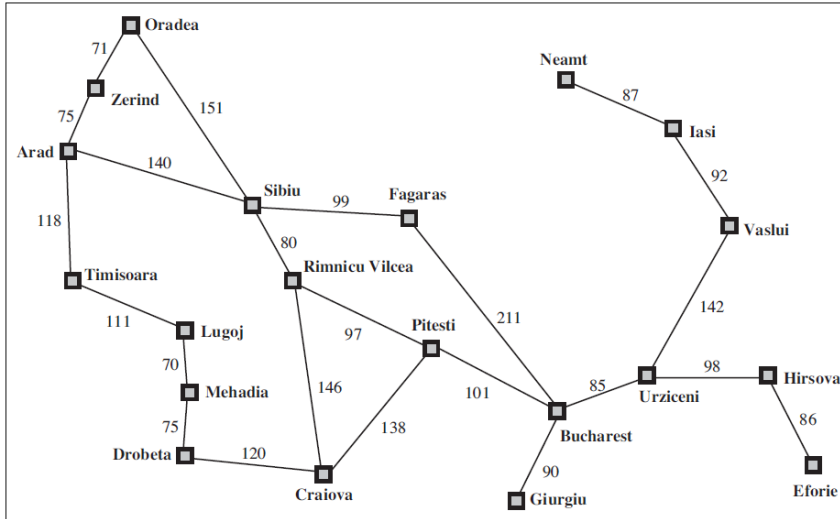| 11	Illustrate the working principle of Goal Based Agents. (13)	**BTL3**	**Applying**
12	Point out the procedure for the Construction of Binary Search trees with an example. (13)	**BTL4**	**Analyzing**
13	Infer the working of Simple Reflex and Model Based Reflex agents. (13)	**BTL4**	**Analyzing**
14	Analyze about the Cognitive Modeling and Laws of Thought approaches in understanding the definition of AI. (13)	**BTL4**	**Analyzing**
15	Draw the architecture of Utility Based Agent. Explain how it is better than Goal Based Agent. (13)	**BTL5**	**Evaluating**
16	Evaluate the State space representation of 8-Queens Problem. (13)	**BTL5**	**Evaluating**
17	Consider the Vacuum World Problem with two rooms A and B. Construct the State Transition Diagram and Operation table. (13)	**BTL6**	**Creating**
PART – C			
1	Explain in detail about the Incremental and Complete State Problem formulation approaches with examples. (15)	**BTL5**	**Evaluating**
2	Assess the following types of Intelligent Agents (i) Goal Based Agent (8) (ii) Utility based Agent (7)	**BTL5**	**Evaluating**
3	How the Tree and Graph Structures are useful in solving the Real world problems? Design and Develop some of the problem domains where these two data structures play a vital role. (15)	**BTL6**	**Creating**
4	What is the Future Scope of Artificial Intelligence? Mention some application areas in which AI may be used extensively. (15)	**BTL6**	**Creating**
5	Construct the State Transition Diagram for Vacuum World Problem with Sensors. (15)	**BTL6**	**Creating**

UNIT II   SEARCH ALGORITHMS

Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search

PART – A

Q.No.	Questions	BT Level	Competence
1	Identify the key idea of Random Search.	BTL1	Remembering
2	Define A* Search.	BTL1	Remembering
3	State Heuristic Search.	BTL1	Remembering
4	List out the types of Un-Informed Search techniques.	BTL1	Remembering
5	What are the merits of Open List Search?	BTL1	Remembering
6	List out the limitations of Depth First Search.	BTL1	Remembering
7	Enlist some of the Two Player games.	BTL2	Understanding
8	Mention the types of Informed Search techniques.	BTL2	Understanding
9	State the principle of alpha-beta pruning technique.	BTL2	Understanding
10	State the limitations of Random Search.	BTL2	Understanding
11	Differentiate between Informed and Un-Informed Search.	BTL2	Understanding
12	When you can apply and use Brute force techniques?	BTL3	Applying
13	Enlist the advantages of Heuristic Search technique.	BTL3	Applying
14	How is the infinite loop issue resolved in Depth First Search?	BTL3	Applying
15	How pruning helps in graph search?	BTL3	Applying
16	Suggest algorithm for finding shortest path in a map.	BTL4	Analyzing
17	Infer the benefits of A* Search.	BTL4	Analyzing
18	List the restrictions placed on random search.	BTL4	Analyzing
19	Analyze the role of pruning in multiplayer games.	BTL4	Analyzing
20	Compare and Contract Breadth First and Depth First Search.	BTL5	Evaluating
21	Assess the demerits of Closed List Search.	BTL5	Evaluating
22	Evaluate why Best First Search is called Greedy Search.	BTL5	Evaluating
23	Formulate the applications of A* Search.	BTL6	Creating
24	Assemble the idea of Best First Search.	BTL6	Creating

PART – B

1	Describe the Random Search algorithm in detail. (13)	BTL1	Remembering
2	Discuss the optimality of A* Search algorithm. (13)	BTL1	Remembering
3	Explain the Closed List Searching with an example. (13)	BTL1	Remembering
4	Describe the Depth First Search algorithm. (13)	BTL1	Remembering
5	Interpret the Open List Searching Technique. (13)	BTL2	Understanding
6	Illustrate the Breadth First Search algorithm. (13)	BTL2	Understanding
7	State and explain the Min-max game Search algorithm. (13)	BTL2	Understanding
8	Trace the Best First Search algorithm using an example. (13)	BTL2	Understanding
9	How Optimal Decisions can be made in Games? Explain with a suitable example. (13)	BTL3	Applying
10	Write Short notes on (i) Minmax Algorithm (7) (ii) Minmax Algorithm with Alpha-Beta cutoff (6)	BTL3	Applying

11	Apply the following search techniques on graphs (i) Iterative Deepening Search (7) (ii) Depth Limited Search (6)	**BTL3**	**Applying**
12	Discuss in detail the uninformed search strategies and compare the analysis of various searches. (13)	**BTL4**	**Analyzing**
13	Write A* algorithm and discuss briefly the various observations about algorithm. (Refer the Map, Table in Q.No:4, Part-C) (13)	**BTL4**	**Analyzing**
14	Analyze the merits and demerits of Breadth First Search and Depth-First Search algorithms. (13)	**BTL4**	**Analyzing**
15	Assess the types of memory bounded heuristic search. (13)	**BTL5**	**Evaluating**
16	Evaluate Greedy Best First Search with an example.(Refer the Map, Table in Q.No:4, Part-C) (13)	**BTL5**	**Evaluating**
17	Formulate a Search graph and applyany one the informed search strategy on the map given below to find the minimum path cost for reaching a goal state. (Refer the Map in Q.No:4, Part-C) (13)	**BTL6**	**Creating**
PART – C			
1	Assess Closed List search and Open List Search algorithms. Judge whether which works better in terms of finding the optimal solution. (15)	**BTL5**	**Evaluating**
2	Evaluate the uniform cost search and Bi-directional Search with examples. (15)	**BTL5**	**Evaluating**
3	Construct alpha-beta pruning algorithm and the Min-max game playing algorithm with example. (15)	**BTL6**	**Creating**

4	Formulate A* Search to find the minimum cost to reach the Goal State Bucharest from the Initial State Arad using the given map and Straight Line Distance Heuristics h$_{SLD}$. (15)	BTL6	Creating
	Values of h_{SLD}—straight-line distances to Bucharest.		
5	Construct and Trace the Recursive Best First Search (RBFS) for the problem given in Q. No: 4. (Note: Use the same Map and h$_{SLD}$ Table values.) (15)	BTL6	Creating

The map labels and distances:

Oradea, 71, Zerind, 151, 75, Arad, 140, 118, Sibiu, 99, Fagaras, 80, Rimnicu Vilcea, Timisoara, 111, Lugoj, 97, Pitesti, 211, 70, Mehadia, 146, 101, 85, Urziceni, 98, Hirsova, 75, 138, Bucharest, 86, Drobeta, 120, Craiova, 90, Giurgiu, Eforie, Neamt, 87, Iasi, 92, Vaslui, 142

Values of h_{SLD}—straight-line distances to Bucharest:

Arad	366	Mehadia	241
Bucharest	0	Neamt	234
Craiova	160	Oradea	380
Drobeta	242	Pitesti	100
Eforie	161	Rimnicu Vilcea	193
Fagaras	176	Sibiu	253
Giurgiu	77	Timisoara	329
Hirsova	151	Urziceni	80
Iasi	226	Vaslui	199
Lugoj	244	Zerind	374

UNIT III PROBABILISTIC REASONING

Probability, Conditional Probability, Bayes Rule, Bayesian Networks- Representation, Construction And Inference, Temporal Model, Hidden Markov Model

PART – A

Q.No.	Questions	BT Level	Competence
1	Define Bayes theorem. Give the Bayes rule equation.	BTL1	Remembering
2	What is Hidden Markov Model?	BTL1	Remembering
3	Define Probability.	BTL1	Remembering
4	Enlist the main causes of uncertainty.	BTL1	Remembering
5	What is Temporal model? List out its types.	BTL1	Remembering
6	Give some examples for uncertainty.	BTL1	Remembering
7	State in your own words about conditional probability.	BTL2	Understanding
8	How do Agents handle uncertainty?	BTL2	Understanding
9	Interpret Belief State.	BTL2	Understanding
10	What is Dynamic Bayesian Network?	BTL2	Understanding
11	What you mean by probabilistic reasoning?	BTL2	Understanding
12	Infer Conditional Probability.	BTL3	Applying
13	Identify the role of smoothing in Temporal model.	BTL3	Applying
14	Examine the concept of prior probability.	BTL3	Applying
15	Draw the state transition diagram for Markov system.	BTL3	Applying
16	How the Conditional Probability of an event is calculated?	BTL4	Analyzing
17	Infer the principal inference tasks in temporal models.	BTL4	Analyzing
18	Analyze Hybrid Bayesian Network.	BTL4	Analyzing
19	Identify the algorithm used by HMM.	BTL4	Analyzing
20	Assess Bayesian networks with an example.	BTL5	Evaluating
21	Appraise Filtering in Temporal model.	BTL5	Evaluating
22	Evaluate the need for Localization in HMM.	BTL5	Evaluating
23	Formulate the Bayesian Network for Heart Attack.	BTL6	Creating
24	Given that $P(A)=0.3, P(A \mid B)=0.4$ and $P(B)=0.5$, compute $P(B \mid A)$.	BTL6	Creating

PART – B

1	Describe Hidden Markov Model and its applications in AI. (13)	BTL1	Remembering
2	Explain the probabilistic reasoning with suitable examples. (13)	BTL1	Remembering
3	Discuss method for constructing Bayesian networks. (13)	BTL1	Remembering
4	What is the role of Filtering and prediction in Temporal Model Inference? (13)	BTL1	Remembering
5	Write Short notes on (i) Dynamic Bayesian Networks (7) (ii) Hybrid Bayesian Networks (6)	BTL2	Understanding
6	Describe the Simplified matrix algorithm in HMM. (13)	BTL2	Understanding
7	Discuss the need and structure of Bayesian network. (13)	BTL2	Understanding
8	(i) Define uncertain knowledge, prior probability and Conditional probability. (7) (ii) Examine belief networks briefly. (6)	BTL2	Understanding

9	Marie's marriage is tomorrow • In recent years, each year it has rained only 5 days • The weatherman has predicted rain tomorrow • When it actually rains the weatherman correctly forecasts rain 90% of the time • When it doesn't rain, the weatherman incorrectly forecasts rain 10% of time. What is the probability that it will rain on the day of Marie's wedding? (13)	**BTL3**	**Applying**
10	(i) List down the applications of Bayesian network. (7) (ii) Discuss forward – backward algorithm in detail. (6)	**BTL3**	**Applying**
11	Interpret variable elimination algorithm for answering queries in Bayesian network. (13)	**BTL3**	**Applying**
12	Analyze the method of performing exact inference in Bayesian network. (13)	**BTL4**	**Analyzing**
13	Analyze how inference in done using Temporal Model. (13)	**BTL4**	**Analyzing**
14	Infer about Compactness and node ordering in Bayesian Networks. (13)	**BTL4**	**Analyzing**
15	How is the Bayesian network used in representing the uncertainty about the knowledge? (13)	**BTL5**	**Evaluating**
16	Elaborate the concept of the Temporal Model. (13)	**BTL5**	**Evaluating**
17	Formulate the solution for Localization problem in Hidden Markov model with an example. (13)	**BTL6**	**Creating**
PART – C			
1	Assess how approximate inference in done using Temporal Model. (15)	**BTL5**	**Evaluating**
2	Evaluate how probabilistic reasoning is used in Uncertainty? Explain with an example case. (15)	**BTL5**	**Evaluating**
3	Assemble the various application domains of Bayesian network. Consider the problem of diagnosing (15)	**BTL6**	**Creating**
4	Formulate how problems can be addressed by using Hidden Markov Model. (15)	**BTL6**	**Creating**
5	What is the maximum number of edges in a Bayesian Network (BN) with n nodes? Prove that a valid BN containing this number of edges can be constructed (remember that the structure of a BN has to be a Directed Acyclic Graph). (15)	**BTL6**	**Creating**

UNIT IV EMBEDDED CONCEPT

Introduction to Embedded Systems, Application Areas, Categories of Embedded Systems, Overview of Embedded System Architecture, Specialties of Embedded Systems, Recent Trends in Embedded Systems, Architecture of Embedded Systems, Hardware Architecture, Software Architecture, Application Software, Communication Software, Development and Debugging Tools.

PART – A

Q.No.	Questions	BT Level	Competence
1	Define Embedded System.	BTL1	Remembering
2	What are the application areas of Embedded System?	BTL1	Remembering
3	Compare Microprocessor and Microcontroller.	BTL1	Remembering
4	Draw and compare von-Neumann and Harvard architecture.	BTL1	Remembering
5	List out the Categories of Embedded System.	BTL1	Remembering
6	Mention the components of embedded system.	BTL1	Remembering
7	What are the two essential units of a processor on an embedded system?	BTL2	Understanding
8	Name some of the hardware parts of embedded systems.	BTL2	Understanding
9	What are the various types of memory in embedded systems?	BTL2	Understanding
10	Give some examples for sophisticated embedded systems.	BTL2	Understanding
11	What are the languages used in embedded system?	BTL2	Understanding
12	Identify the recent trends in embedded systems.	BTL3	Applying
13	Draw the basic structure of an embedded system.	BTL3	Applying
14	Sketch the different embedded system types.	BTL3	Applying
15	Show the significance of Communication Software.	BTL3	Applying
16	Classify the processors in embedded system.	BTL4	Analyzing
17	Infer the need for watch dog timer.	BTL4	Analyzing
18	Difference between CISC and RISC.	BTL4	Analyzing
19	Give some examples for medium scale embedded systems.	BTL4	Analyzing
20	Evaluate the role of Development and debugging Tools.	BTL5	Evaluating
21	Draw and assess the embedded system software architecture.	BTL5	Evaluating
22	Appraise the role of AI in Embedded Applications.	BTL5	Evaluating
23	Formulate the challenges of embedded systems.	BTL6	Creating
24	Construct the various application domains of embedded AI.	BTL6	Creating

PART – B

1	Describe the characteristics features of embedded system. (13)	BTL1	Remembering
2	List out and explain the components of embedded system. (13)	BTL1	Remembering
3	Explain the classification of embedded systems with examples. (13)	BTL1	Remembering
4	Summarize the difference between Microprocessor and Microcontroller. (13)	BTL1	Remembering
5	Describe the advanced architectures of embedded processor with neat diagram. (13)	BTL2	Understanding
6	Discuss about Real Time Operating Systems and its types. (13)	BTL2	Understanding
7	Point out the Specialties of Embedded Systems. (13)	BTL2	Understanding
8	With a neat diagram explain the working of Direct Memory Access (DMA) with architecture. (13)	BTL2	Understanding
9	List out and explain the Categories of Embedded System. (13)	BTL3	Applying

10	Identify the recent trends in embedded systems. (13)	**BTL3**	**Applying**
11	Determine how to choose the Software architectures for building any embedded system application. (13)	**BTL3**	**Applying**
12	Explain the main components of Embedded hardware units with neat diagram. (13)	**BTL4**	**Analyzing**
13	Infer the need of Communication Software and protocols. (13)	**BTL4**	**Analyzing**
14	Analyze the types of Development and debugging Tools. (13)	**BTL4**	**Analyzing**
15	Evaluate the need for Communication Software. (13)	**BTL5**	**Evaluating**
16	Appraise the role of embedded artificial intelligence. (13)	**BTL5**	**Evaluating**
17	Recommend an embedded processor for any application of your own. (13)	**BTL6**	**Creating**
PART – C			
1	Mention the necessary hardware units that must be present in the embedded systems. (15)	**BTL5**	**Evaluating**
2	Elaborate about Structural unit of Embedded Processor including processor architecture and advanced processor architecture. (15)	**BTL5**	**Evaluating**
3	Analyze the importance of hardware architectures while developing an embedded system. (15)	**BTL6**	**Creating**
4	Construct the various application domains of embedded AI. (15)	**BTL6**	**Creating**
5	Formulate the necessary Hardware, Software, Processors, memory and tools required for developing AI based embedded system for any application domain of your choice. (15)	**BTL6**	**Creating**

UNIT V CONTROL HARDWARE AND INTERFACING

Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications

PART – A

Q.No.	Questions	BT Level	Competence
1	Define Robotics.	BTL1	Remembering
2	Identify the Components of a Robot.	BTL1	Remembering
3	State some applications of Robotics.	BTL1	Remembering
4	What is an actuator? Give examples.	BTL1	Remembering
5	Define Yaw, Pitch and Roll in Robots.	BTL1	Remembering
6	Name the commonly used robot configurations.	BTL1	Remembering
7	Identify the types of Sensors used in a space exploration robot.	BTL2	Understanding
8	What is end effector? Give some examples of Robot End Effector.	BTL2	Understanding
9	Enlist the types of medical robots in healthcare.	BTL2	Understanding
10	What is meant by gripper? Give the types of grippers.	BTL2	Understanding
11	Infer robot anatomy.	BTL2	Understanding
12	Why servomotors are preferred with stepper motor in robot applications?	BTL3	Applying
13	Give the specifications of industrial robot.	BTL3	Applying
14	Point out the Isaac Asimov's Three Laws of Robotics.	BTL3	Applying
15	Point out any two unique features of a stepper motor.	BTL3	Applying
16	Analyze the various Actuators of an industrial robot.	BTL4	Analyzing
17	Point out any two unique features of a stepper motor.	BTL4	Analyzing
18	Identify the types of sensors used in autonomous vehicles.	BTL4	Analyzing
19	Analyze robot anatomy.	BTL4	Analyzing
20	Assess the characteristics of actuating systems.	BTL5	Evaluating
21	Access some of the Common Sensors Used In Robots.	BTL5	Evaluating
22	Evaluate the structure of robot.	BTL5	Evaluating
23	Formulate the role of software Bots in IT domain.	BTL6	Creating
24	Assemble the Recent Trends in Robotics.	BTL6	Creating

PART – B

1	Explain the role of Robotics in Health Care domain. (13)	BTL1	Remembering
2	Explain the following: (i) Robot anatomy. (7) (ii) Robot wrist. (6)	BTL1	Remembering
3	Describe salient features of robot in different fields of applications. (13)	BTL1	Remembering
4	Summarize the advantages of four common robot configurations and deduce their simple sketches. (13)	BTL1	Remembering
5	Identify the components of an Autonomous Space Exploration mobile rover robot. Explain each component briefly. (13)	BTL2	Understanding
6	Describe any four basic robot configurations with neat sketch and narrate individual merits, demerits. (13)	BTL2	Understanding
7	Discuss about the need for Robots with suitable examples. (13)	BTL2	Understanding
8	What do you understand by Software Robots or Bots? (13)	BTL2	Understanding
9	Illustrate with neat sketch about the basic robot motions. (13)	BTL3	Applying

10	Sketch a robot wrist and indicate wrist pitch, wrist yaw and wrist roll. (13)	**BTL3**	**Applying**
11	(i) Discuss about robot machine interface with neat diagram. (7) (ii) With neat sketch describe the multiple robot coordination in manufacturing.(6)	**BTL3**	**Applying**
12	Analyze the programming tools available for Robot. (13)	**BTL4**	**Analyzing**
13	Discuss about the features of the various drive systems for an Industrial robot. (13)	**BTL4**	**Analyzing**
14	Infer how the Robots / bots are programmed to do some automated tasks. (13)	**BTL4**	**Analyzing**
15	Explain the working of a stepper motor with suitable diagrams. (13)	**BTL5**	**Evaluating**
16	Analyze about the robot drive system selection procedure in detail. (13)	**BTL5**	**Evaluating**
17	Elaborate the five key artificial intelligence trends in 2022. (13)	**BTL6**	**Creating**

PART – C

1	Assess the architecture of robot in detail. (15)	**BTL5**	**Evaluating**
2	Compare the servo motor with stepper motor; choose suitable drive system for industrial robot along with your justification. (15)	**BTL5**	**Evaluating**
3	Assemble the various open source tools for Programming Mobile Robots. (15)	**BTL6**	**Creating**
4	Develop salient features of robot in different fields of applications. Explain at least two recent applications in emerging technology of your choice. (15)	**BTL6**	**Creating**
5	Formulate the important components and tasks of Space Research and Exploration mobile robot. How it is able to act on an unknown and uncertain environment? Justify your answer with technical specifications and details. (15)	**BTL6**	**Creating**

Staff In-charege(s)   Course Coordinator   HOD