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ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, MAY 2025

MINOR DEGREE
COMMON TO ALL BRANCHES
ITM501 ARTIFICIAL INTELLIGENCE
(Regulation2019)

Time:3hrs Max.Marks: 100

CO1	**Understand and apply search strategies for real time problems.**
CO2	**Apply reasoning techniques to real world problem.**
CO3	**Derive Inferences using Lower order Logic.**
CO4	**Understand the usage of various AI planning techniques.**
CO5	**Design and use various learning models based on the problem requirements.**
CO6	**Create AI application for a particular problem in NLP domain**

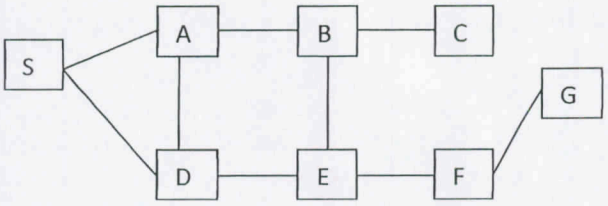
BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A(10x2=20Marks)
(Answer all Questions)

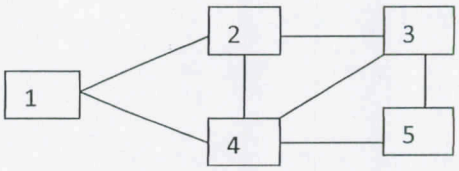
Q.No.	Questions	Marks	CO	BL
1	Compare Deterministic agent versus Non Deterministic agent	2	CO1	L2
2	What are the limitations of propositional logic?	2	CO1	L1
3	Differentiate between Universal quantification and Existential Quantification.	2	CO2	L2
4	What are all the advantages of Forward chaining?	2	CO2	L1
5	Define Classical Planning.	2	CO4	L1
6	Consider the document that has a sentence "Artificial Intelligence is the need for the hour". Identify the types and tokens of the sentence.	2	CO3	L3
7	Define the following term Bias and variance with example.	2	CO4	L1
8	What is idea behind K-fold cross validation and when it is known as leave-one-out cross validation?	2	CO4	L2
9	List the characteristics of RNN?	2	CO5	L1
10	Consider the following hypothetical documents. Doc 1- Machine learning is a core subject Doc 2 – English is a preferred subject Find the TF - IDF for the word "is" .	2	CO6	L3

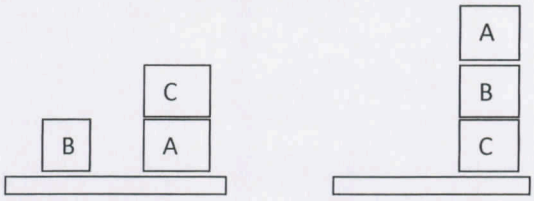
PART- B(5x 13=65Marks)
(Restrict to a maximum of 2 subdivisions)

Q.No.	Questions	Marks	CO	BL

11 (a)	Find the minimum path distance from S to G using A * search algorithm.  	**13**	CO1	L5

	S	A	B	C	D	E	F	G	h (n)
S	0	3	0	0	4	0	0	0	11.5
A	3	0	4	0	5	0	0	0	10.1
B	0	4	0	4	0	5	0	0	5.8
C	0	0	4	0	0	0	0	0	3.4
D	4	5	0	0	0	2	0	0	9.2
E	0	0	5	0	2	0	4	0	7.1
F	0	0	0	0	0	4	0	3.5	3.5
G	0	0	0	0	0	0	3.5	0	0

	OR			
11 (b)	Define Constraint Satisfaction Problem. Using CSP search algorithm, Color each node of the graph given below either with red, green or blue in such a way that no neighbouring node have the same color.  	13	CO1	L5
12 (a)	Write in detail about knowledge process steps and process of converting a sentence to Conjunctive normal form for first order logic.	13	CO2	L3
	OR			
12 (b)	Use resolution for the following facts 1.John likes all kind of food 2.Apple & Vegetables are food 3.Anything anyone eats and not killed is food 4.Anil eats peanuts and still alive 5.Hary eats everything that anil eats and prove that "John likes peanuts"	**13**	CO2	L3
13 (a)		**13**	CO3	L3



Start state Goal State

Use STRIPS to define actions and states appropriately first with Preconditions and effects. Then derive a step by step plan.to arrange the block as in goal state from start state

OR

13 (b)	The Monkey-and-bananas problem is faced by a monkey in a laboratory with some bananas hanging out of reach from the ceiling. A box is available that will enable the monkey to reach the bananas if he climbs on it. Initially, the monkey is at A, the bananas at B, and the box at C. The monkey and box have height Low, but if the monkey climbs onto the box he will have height High, the same as the bananas. The action available to the monkey include Go from one place to another, Push an object from one place to another, ClimbUp onto or Climdown from an object, and Grasp or Ungrasp an object. The result of a Grasp is that the monkey holds the object if the monkey and object are in same place at the same height. a. Write Down the initial description b. Write the six action schemas c. Write the step by step plan to grab the banana.	13	CO3	L3

14 (a)	Apply regression analysis and predict the marks likely to be scored by the student if studying for 22 and 25 hours. Write what you infer from the resultant values.	**13**	CO4	L4

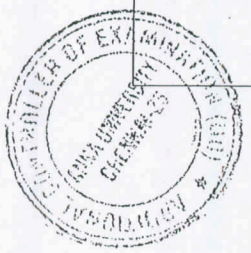
Hours Opened	Item Sold
1	15
5	20
10	40
15	60
20	80

OR

14 (b)	Construct a decision tree using ID3 algorithm for the following data set.	**13**	CO4	L4

S.No	CGPA	Interactiveness	Practical Knowledge	Commu Skills
1	>=9	Yes	Very good	Good
2	>=8	No	Good	Modera
3	>=9	No	Average	Poor
4	<8	No	Average	Good
5	>=8	Yes	Good	Modera
6	>=9	Yes	Good	Modera
7	<8	Yes	Good	Poor

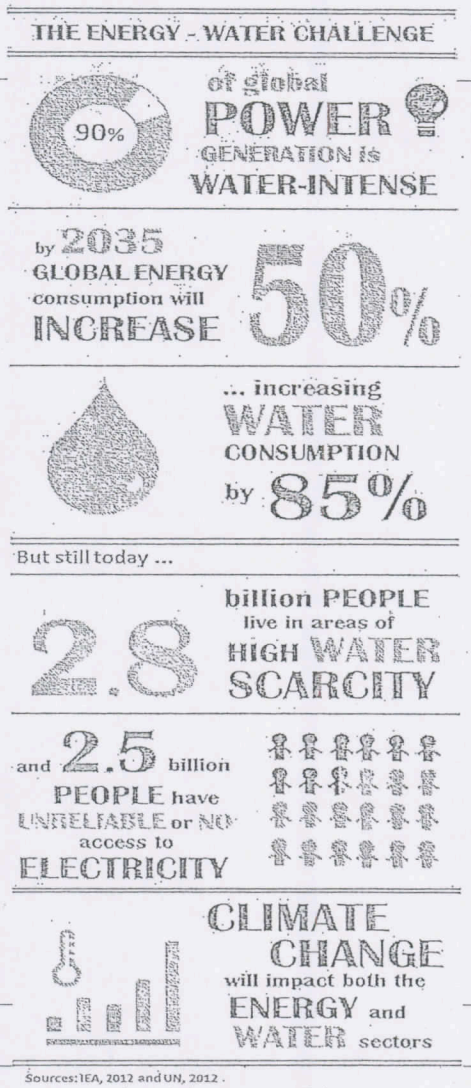
	8	>=9	No	Very Good	Good		Yes	
	9	>=8	Yes	Good	Good		Yes	
	10	>=8	Yes	Average	Good		Yes	
15 (a)	(i) Explain in detail the different topologies of RNN. (7) (ii) Suggest an application overview for any two RNN topologies?(6)					**13**	CO5	L3
	OR							
15 (b)	(i). Explain in detail with an example about Bag-of-words model. (5) (ii). Which of the following statements are more similar and which words in that statement plays a major role in determining the similarity. (8) a.It is going to rain today. b.Today I am not going outside. c.I am going to watch the season premiere.					13	CO5	L3



PART- C(1x 15=15Marks)
(Q.No.16 is compulsory)

Q.No.	Questions	Marks	CO	BL
16.	Tag the given sentence **"Jane Will Spot Will"** with parts of speech tags using Hidden Markov Model based on the following data set. a. Calculating Emission and Transition Probability (8) b. Tagging the given Sentences (4)	**15**	CO6	L4

Mary	Jane	Can	See	Will
(N)	**(N)**	**(M)**	**(V)**	**(N)**
Spot	Will	See	Mary	
(N)	**(M)**	**(V)**	**(N)**	
Will	Jane	Spot	Mary	
(M)	**(N)**	**(V)**	**(N)**	
Mary	Will	Pat	Spot	
(N)	**(M)**	**(V)**	**(N)**	



Look at the infographic on energy-water challenge and answer the following questions:

(1) Study the infographic and find out what these numbers refer to? (4 marks)

(a) 2035 (b) 2.5

(c) 2012 (d) 90%

(2) Why might climate change worsen the energy and water crisis according to the infographic? (2 marks)

(3) By what year is water consumption to increase by 85%? (1 mark)

(4) What is the meaning of 'unreliable electricity'? (1 mark)

(5) List any three challenges people face due to water scarcity and energy shortages. (3 marks)

(6) How could a rise in energy demand indirectly worsen global water issues? (2 marks)

PART- C(1x 15=15Marks)

(Q.No.16 is compulsory)

Q.No.	Questions	Marks	CO	BL
16.	Read the passage and answer the following questions: Electric vehicles have arrived. With technology led by Tesla, and the world's major car manufacturers following along behind, electric vehicles are now a common sight on the roads of most developed countries. Yet the situation in less developed countries is rather different; the only African country to have started the change to electric vehicles is South Africa and even there, electric vehicle sales still account for less than 1% of the total. In South America, the situation is better, with all Latin American countries beginning the move towards electric vehicles, particularly Columbia which, in 2020, had a third of the continent's total electric car fleet. In Russia, the wealthy invested in imported electric cars until the invasion of Ukraine stopped most imports; rather a very small number of electric vehicles were manufactured locally. In India, the government is promoting the purchase of electric vehicles with **tax exemptions** and other incentives. So electric cars have arrived, and their share of the market is increasing almost worldwide. Does this mean, therefore, that the world is on track **to phase out the use of petrol-driven vehicles** in less than thirty years? And does this mean that electric vehicles will be the sustainable solution to our transport needs for the second half of the century? Unfortunately, to the	15	4	3

disappointment of some people, the answer to both of these questions has to be "no".

The massive development of electric vehicles can only be possible if two conditions are met. Firstly, the expansion of electric vehicle manufacturing is dependent on the fragile ability of manufacturers to source vastly increased quantities of vital components and elements without which electric vehicles cannot operate; these include lithium, cobalt, and "rare earths" such as neodymium and tantalum, as well as silicon chips which have already been in short supply since 2020. Secondly, few countries currently have electricity grids that are anywhere near being able to cope with the huge increase in demand for electricity that will accompany any rapid growth in electric vehicle ownership. Without adequate supplies of all the vital ingredients of electric motors and batteries, or without power supplies that can provide the electricity required to recharge millions of electric batteries every day (as well as supplying the current we need for everything else, such as lighting, heating, trains, and electric devices), the electric car revolution will **run up against insoluble problems** in all but the most developed countries.

Governments and vehicle manufacturers are fully aware of these issues, but the consensus among policy-makers seems to be that somehow technology will come up with the answers, as it often has in the past. Ultimately the success of the transition to electric-powered vehicles will depend on advances in technology in three fields; the weight of batteries, the amount of power that they can produce, and the speed at which they can be recharged... or exchanged.

Battery exchange stations, rather than battery recharging points, may perhaps solve the problem of slow recharging times which currently prevents owners from taking their electric vehicles on long trips. Yet battery exchange is not an option with today's large heavy batteries. While the latest generation of Lithium-ion batteries is almost twice as efficient as the batteries being used just five years ago, they remain big and heavy. Before batteries can become easy to exchange, a **quantum leap** in battery technology is needed, one which will allow batteries to store much larger amounts of electricity in much smaller and lighter units. Teams of top electrical engineers in universities and private laboratories worldwide are working on battery technology, and progress has been rapid. New types of lithium batteries are being developed, but the radical discovery that will revolutionize battery design is still to be made.

As for the availability of clean renewable electricity in sufficient quantities to cope with demand from all the world's electric vehicles, progress in this direction is already underway. Ideally, notably in hot countries and outside cities, recharging points will be autonomous, generating their electricity from solar panels and wind or water turbines and storing it either mechanically or in high-powered batteries. The technology already exists, and a California company, Beam Global, recently installed 30 solar-powered recharging stations in sunny parts of the state.

So are people who believe in the ability of technology to solve all our problems realistic, or over-optimistic? For the time being, progress is upwards, but can it continue? In terms of volume, the electric vehicle revolution has only just got underway.

A. Answer the following questions: (7 × 1 = 7)

(1) Why are electric vehicles more common in developed countries?
- (a) The cost is cheaper there
- (b) (b) Infrastructure and affordability support adoption
- (c) Petrol is restricted there
- (d) Only electric vehicles are legal there

(2) What effect did Ukraine invasion have on EV imports to Russia?
- (a) Led to sanctions on Tesla
- (b) Boosted imports
- (c) Increased demand for local cars
- (d) Stopped most imports

(3) What is one incentive India offers for electric vehicles?
- (a) Tax exemptions
- (b) Free insurance
- (c) Import subsidies
- (d) Free recharging

(4) How does the author portray the policy makers in the passage?
- (a) Hopeful and reactive
- (b) Thoughtful but pessimistic
- (c) Ignorant and rushed
- (d) Visionary and planned

(5) Which one of the following sentences, if inserted after the sentence "*Governments and vehicle manufacturers are fully aware of these issues, but the consensus among policy makers seems to be that somehow technology will come up with answers, as it often has in the past.*", would best add value to the argument being developed?
- (a) Consumers in some countries have also expressed concerns about the battery technology.
- (b) Electric vehicles are often quieter than conventional cars and produce zero tailpipe emissions.
- (c) Some critics, however, argue that relying too heavily on future technological breakthroughs could lead to complacency and delayed action.
- (d) Electric vehicles have proven to be less successful in the long run.

(6) Which one of the following statements is true to the passage?
- (a) All developing countries are rapidly switching to electric vehicles.
- (b) The future of electric vehicles depends heavily on advances in battery and energy technologies.
- (c) Battery exchange is already a widely used and efficient method for recharging EVs.
- (d) Most countries already have power grids that can support large-scale EV use.

(7) Which assumption is being questioned in the final paragraph?
- (a) That electric cars are unsafe.
- (b) That petrol cars are coming back
- (c) That demand for EVs will fall
- (d) That technology alone will solve all problems

B. Complete the following sentences based on the passage: (4 × 1 = 4)

(i) The mention of Beam Global's solar-powered stations serves to show that _____

(ii) The two requirements needed for the large scale development of EVs are availability of _____ and _____.

(iii) The smooth changeover to electric vehicles cannot happen unless _____.

(iv) According to the author, the status of the EV technology is _____.

	C. Choose the right meaning for the words / phrases based on the context of the given passage: (4 × 1 = 4) (1) What does the phrase "*tax exemption*" mean? (a) Permission to avoid paying certain taxes (b) Increase in payment of taxes (c) Legal punishment for not paying taxes (d) Extra time given to pay taxes (2) The phrase '*to phase out the petrol-driven vehicles*' means? (a) To gradually stop using petrol-driven vehicles (b) To speed up the production of petrol-driven vehicles (c) To reduce the price of petrol-driven vehicles (d) To redesign the petrol vehicles with electric vehicles. (3) Choose the best synonym for '*quantum leap*'? (a) pioneering steps (b) technical glitch (c) major advancement (d) gradual shift (4) What does the phrase "*run up against insoluble problems*" most likely to mean? (a) Face problems that can't be solved easily (b) Avoid major obstacles through planning (c) Generate solutions for some of the problems (d) Postpone dealing with major issues			