Date:

Pg 1

Syllabus - R16 Class - BE Sem - VII

Reg No - 2017C02 Seat No - 727 8650 Sub - AISC

Q1 MCQ

1) Option : D : Utility Based Agent

2) Option : B : Unification

3) Option : A : $\exists x$ glitters(x) $\wedge$ is gold(x)

4) Option : D : One

5) Option : C : ABDECFG

6) Option : A : Forward State Space Search

7) Option : B : Crossword

8) Option : A : $w_1 = 1, w_2 = 1, T = 1$

9) Option : A : 238

10) Option : B : Plateau.

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Qz A

2) PEAS

(1) PEAS Stands for Performance, Environment, Actuators and Sensors

(2) Based on this properties of an agent, they can be grouped together or can be differentiated from each other.

(3) Each agent has these properties defines for it

i) Performance measure [P]: It specifies the performance expected by the agent.

ii) Environment [E]: It Specifies the surrounding condition where the agent has to perform a task.

iii) Actuators [A]: It specifies the tool available for the agent to complete the task.

iv) Sensors [S]: It specifies the tool required to sense the work environment.

PEAS for Robot maint for cleaning the house.

(1) Performance Measure [P]: Maximize energy Consumption
Maximize Dirt Pickup, Percentage of precision of cleaning.

(2) Environment [E]: House, Dirt Distribution Unknown, assume actions ar deterministic and environment is Static.

(3) Actvators [A]: Joined Arm and hand, View Detector for Robot, Left, Right, Suck and NoOp.

(4) Sensors [S]: Camera Orientation and touch sensors to identify the dirt and potentiometric Sensor.

Environment: Partially Observable, Stochastic, Dynamic, Continuous and Multi Agent.

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Pg-4

Q2 A

1) N queen problem formulation

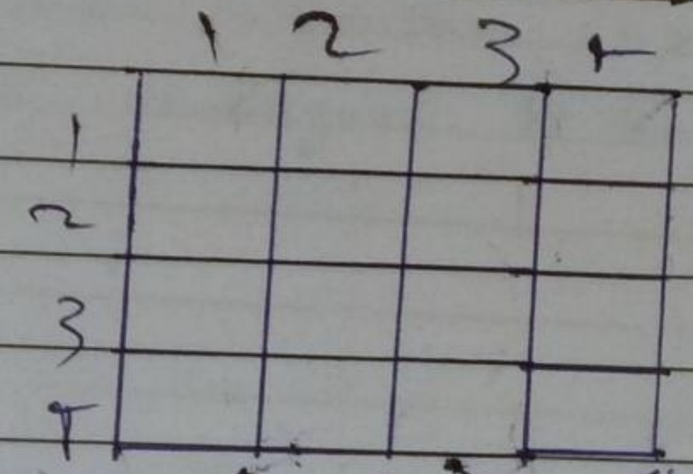
① States: any arrangement of 0 to 4 (n) queens on board.

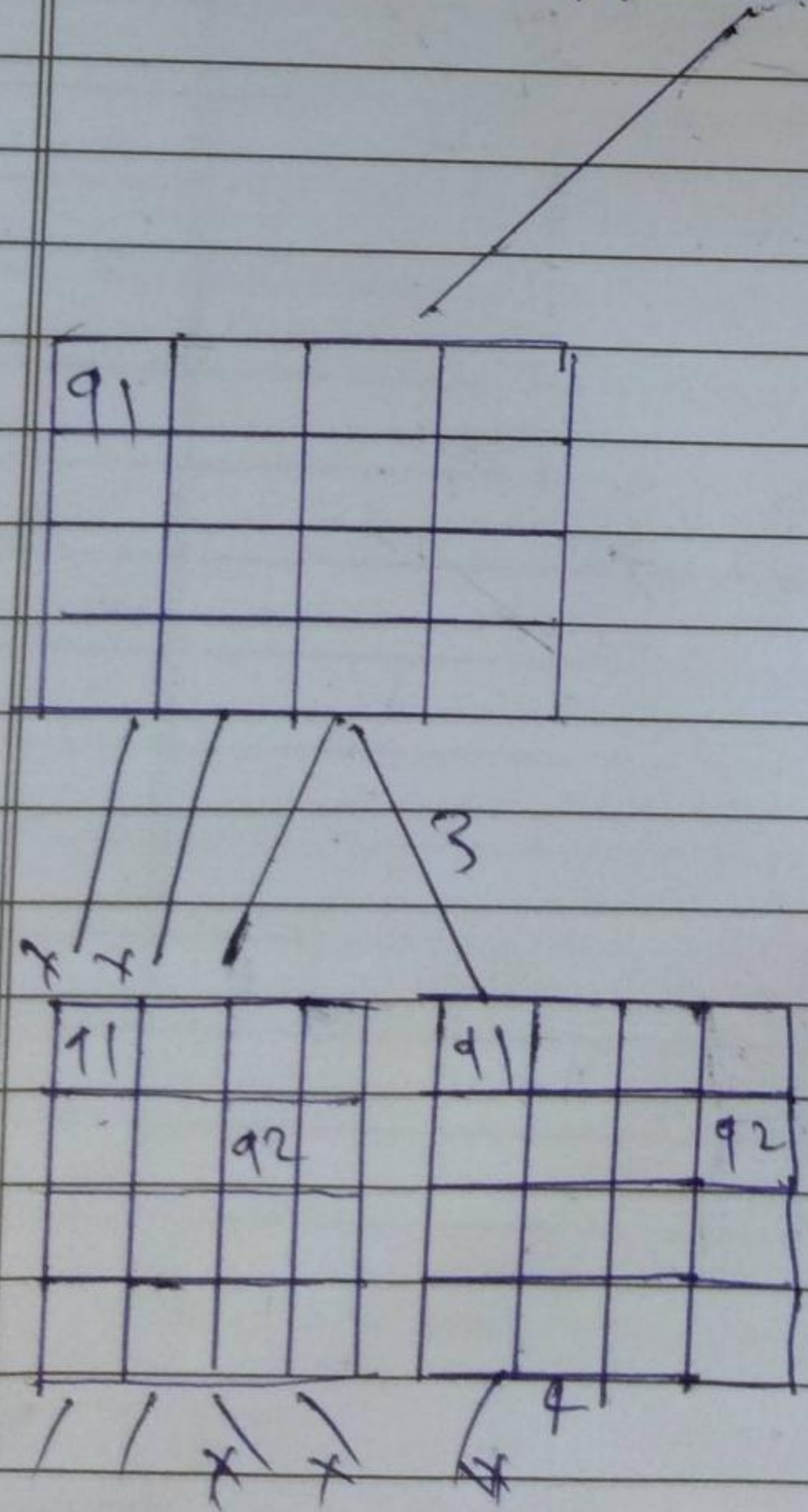
② Operators: adding a successor function queen to any square

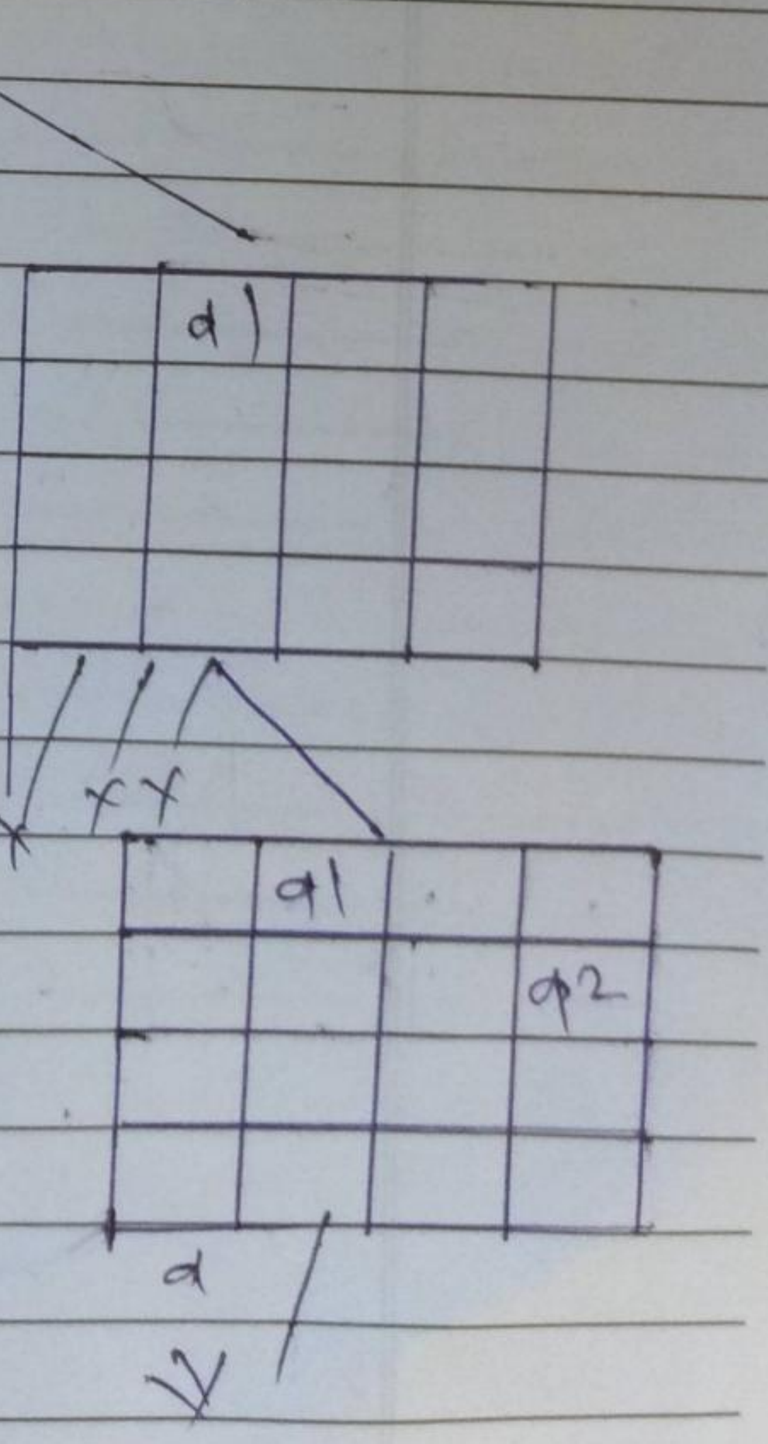
③ Path cost: zero

④ Goal test: n queens on board none attacked.

Consider a 4×4 chess board.







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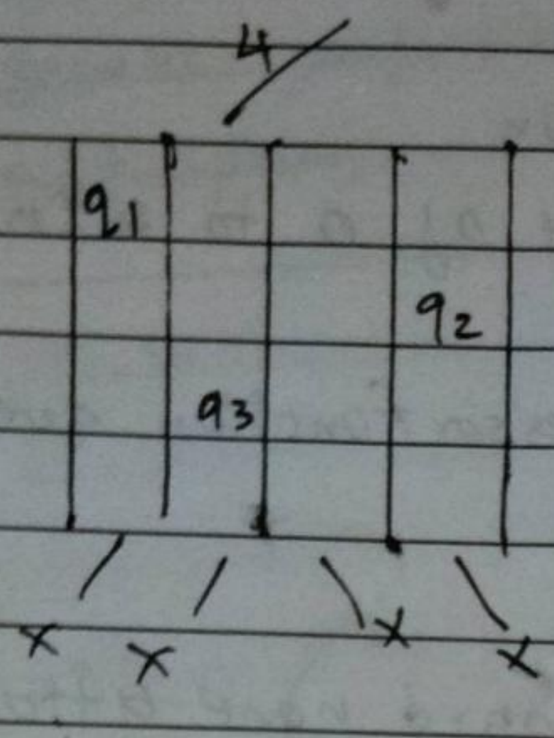

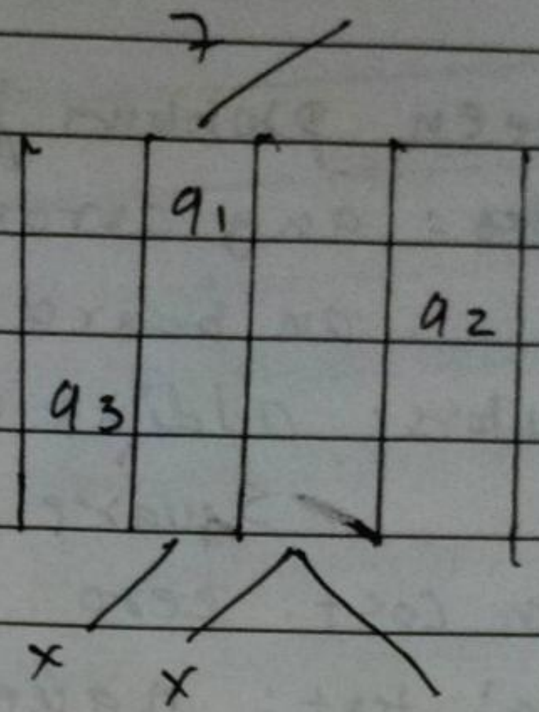

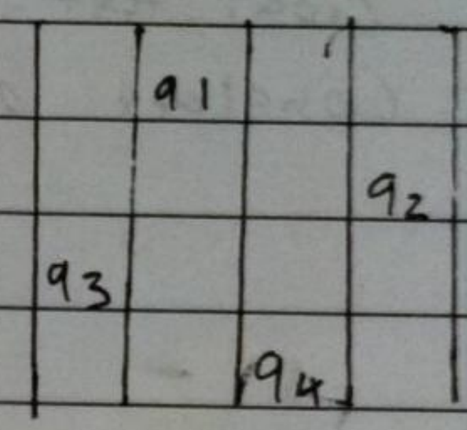

This is Complete State space for 4-queen problem

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Q2 B

2) Architecture of ANFIS.

→ ① ANFIS Stands for Adaptive Neuro Fuzzy interference System.

② It is a kind of artificial neural network that is based on ~~takagi~~ takagi-Sugeno fuzzy ~~inter for~~ inference System.

③ ANFIS was introduced by Jang.

④ ANFIS is used for ~~neutdi~~ modelling, controlling and parameter estimation in complex systems.

⑤ ANFIS is a combination of artificial neural network (ANN) and fuzzy inference System (FIS).

⑥ Combining the ANN and fuzzy-set theory can provide advantages and overcome the disadvantages in both techniques.

★ Features of ANFIS:

① It refines fuzzy IF-THEN rules to describe the ~~behavior~~ behaviour of a complex system.

② It doesnot require any prior human expertise.

③ It is easy to implement

④ It enables fast and accurate learning.

⑤ It offerse desired dataset, greater choic of membership functions to use, Strong generalization abilities.

⑥ Excellent explanation facilities through fuzzy rules.

⑥ It is easy to incorporate both linguistic and numeric knowledge for problem solving.

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ANFIS Architecture.

① In order to explain ANFIS architecture we assumed that there are two inputs x and y

② Two fuzzy if-then rules for a first order Sugeno Fuzzy model can be expressed as follows.

Rule 1: if x is A_1 and y is B_1 then $F_1 = p_1x + q_1y + r_1$

Rule 2: if x is A_2 and y is B_2, then $F_2 = p_2x + q_2y + r_2$

③ Where A_i and B_i are the fuzzy sets, F_i is the output and p_i, q_i and r_i are the design parameters that are determined during the training process.

④ The ANFIS architecture used to implement the two rules is shown in figure.

⑤ Layer 1: In this layer, each node represents node function.

$$O_i = \mu A_i(x), \text{ for } i = 1, 2.$$

Where x is the input to the i^{th} node. Ai is the linguistic label Characterized by proper membership functions. Some of the membership functions are triangle, trapezoidal and Gaussian.

⑥ Layer 2: Each node Calculate The firing Strength of role by multiplication.

$$O_i^2 = w_i = \mu A_i(x) * \mu B_i(y), \quad i = 1, 2.$$

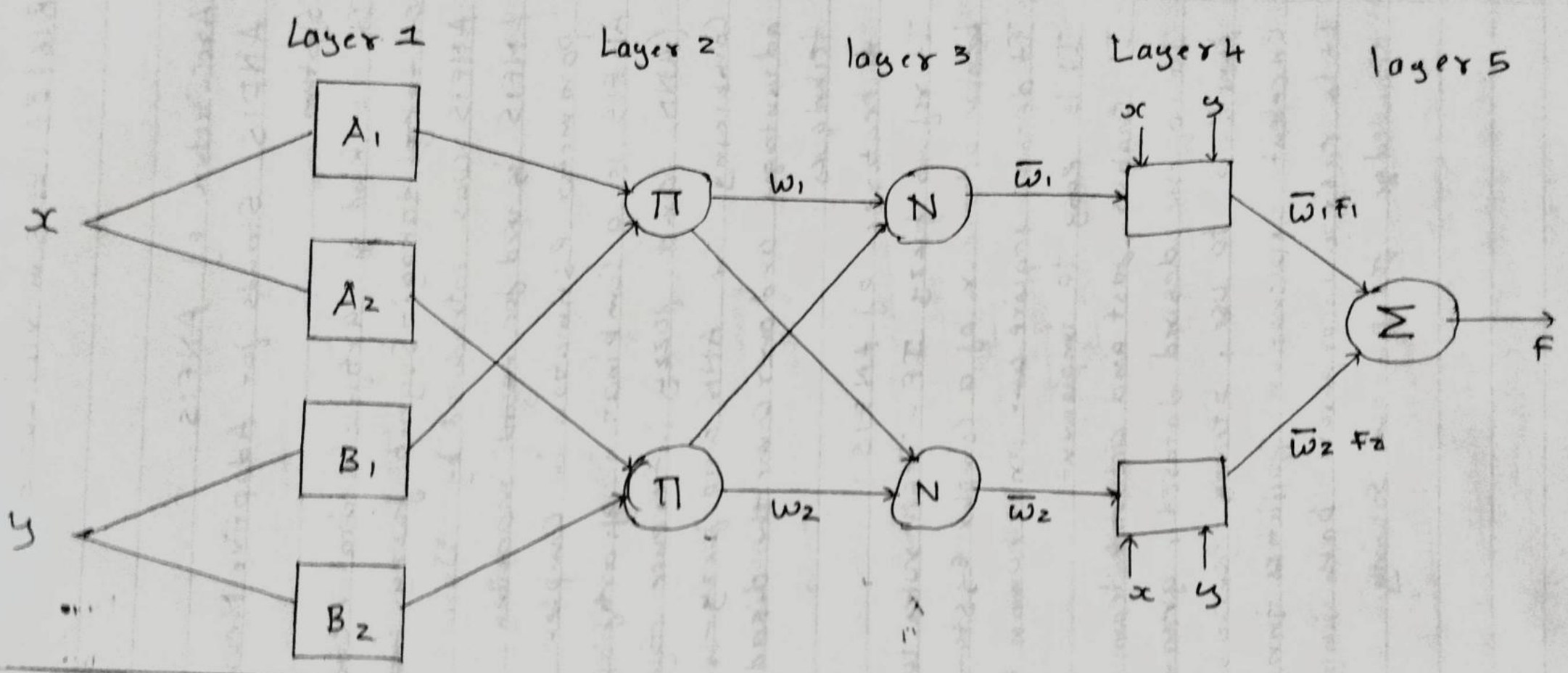
⑦ Layer 3: In this layer, Firing Strength that were evaluated in the previous layer are normalized to distinguish between the firing Strength of rule from the total firing strengths to total rules.

$$O_i^3 = \bar{w}_i = \frac{\bar{w}_i}{w_1 + w_2}, \quad i = 1, 3.$$

⑧ Layer 4: Node i calculates the contribution of i^{th} rule to overall output:

$$O_i^4 = \bar{w}_i * f_i = \bar{w}_i (p_i * x + q_j * y + r_i)$$

Where $\bar{w}_i$ is the output of layer 3.



④ Layer 5 : In this layer the single node calculates the overall o/p as total contribution from each rule

$$O.P = \sum \bar{w}i * fi = \frac{\sum_i w_i * f_i}{\sum_i w_i}$$

⑩ The ANFIS has two learning algorithm, back-propogation and hybrid methods, which try to minimum the error between the observed and predicted data.

Q3 A

1) Partial order Planning

→ (1) Planning is a the process of thinking about & and Orginizing the activities required to achive a desired goal.

(2) Any planning algorithm that can place two actions into a plan without specifying which comes first is called as a Partial Order Planner.

(3) A partial Order planner searches through plane space

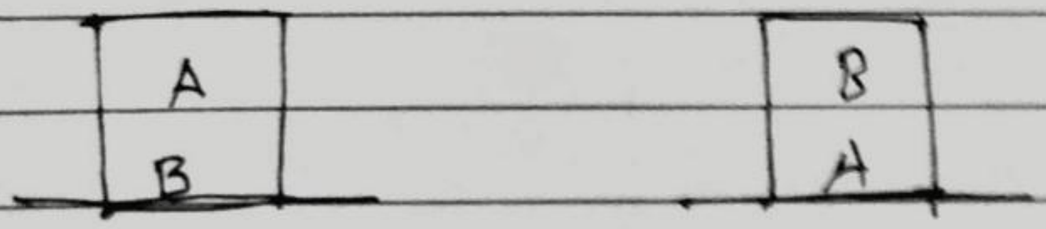
(4) It starts with an initial plan representing the start and finishing steps. and on each itration adds one more step

(5) If it leads to incomplete plan, it backtracks and tries another branch of search space.

(6) The solution is represented as a graph of actions not a sequence of actions.

(7) Example:

Let us defin following two macros for the sake of Simplicity for block world example



Initial State Goal

Block word example.

To achive the Goal state ON(A,B)

i) Move 'A' onto table should occur before move 'B' to 'A'

ii) Hence MOT(A) should came before MOVE(B,A) in the final Plan

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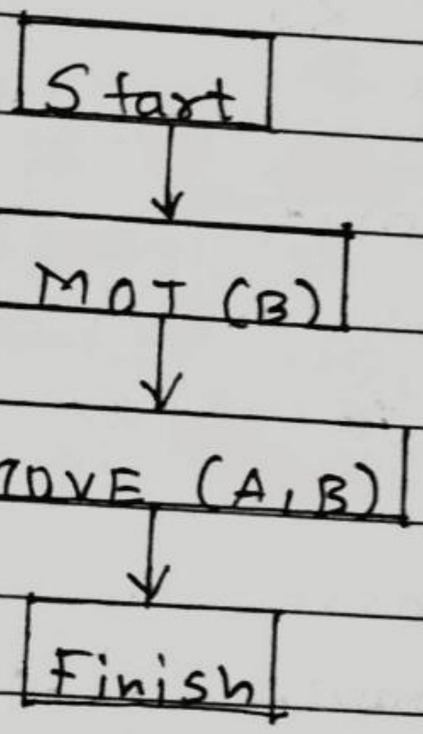
	Macro Operator	Description	
	MOT (A)	Move A onto table	
	MOVE (B,A)	Move B onto A.	

Partial order Planner Graph.

① It contains the dummy Start and finish action to mark the beginning and end of the plan in graph.



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Q3A

2) Expert System.

→ ① Expert Systems are Artificial Intelligence tools.

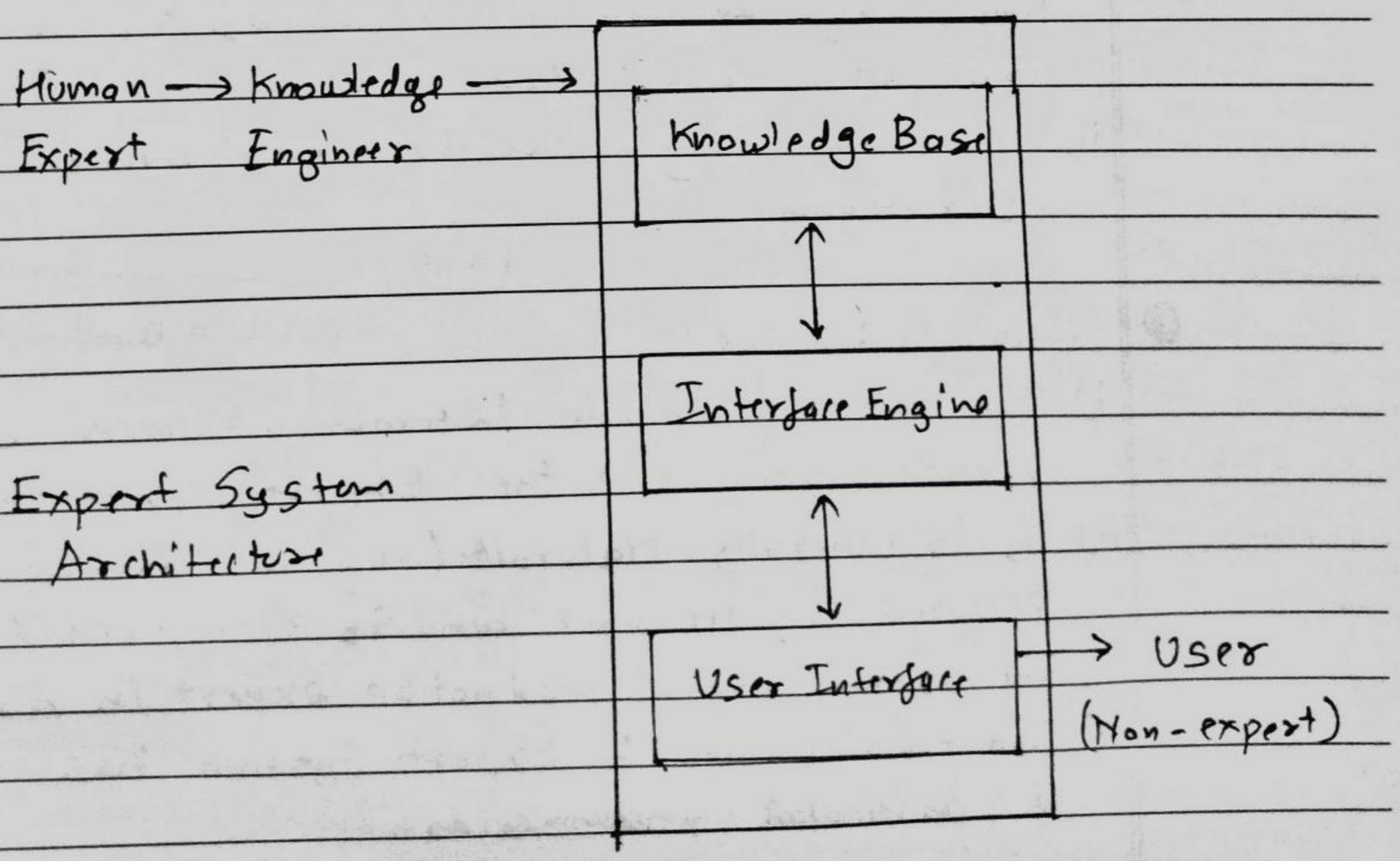
② It capture the experties of ~~the~~ Knowledge workers and provide advice to usually non-experts in a given domain

③ In artifical intelligence, an-expert System is Computer System that emulates the decision-making abilits of a human expert.

④ Expert systems are designed to solve complex problems by reasoning about Knowledge, represented primarily as if-then rules rather than through Conventional procedural code.

⑤ Expert systems are implemented with AI technology often called Expert System Shells.

Architecture of Expert System.



Expert System Architecture

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Characteristic of Expert System.

① High performance
② Understandable.
③ Reliable
④ Highly responsive.

Components.

① Knowledge Base:
i) Knowledge Base is database rules.
ii) It contains domain - specific and high quality knowledge.
iii) Knowledge is required to exhibit intelligence.
iv) The success of a Expert System majority depends upon the collection of highly accurate and precise knowledge.

② Interface Engine:
i) Interface engine acquires and manipulates from the knowledge from the knowledge base to arrive at a particular solution.
ii) Interface Engine use Forward & Backward Chaining Strategies.

③ User Interface:
i) User interface provides interaction between user of the Expert System and the Expert System itself.
ii) It is generally Natural language Processing so as to be used by the user who is well-versed in the task.
iii) The users of expert need not be expert in AI
iv) It explains how the Expert System has arrived at a particular recommendation.

Q3 B

2) U = Flowers = { Jasmine, Rose, Lotus, Daffodil, Sunflower, Hibiscus, Lily }

Soln - Let,

j = Jasmine S = Sunflower

r = rose h = hibiscus

l = lotus li = Lily.

d = Daffodil

Given

P = { 0.3/j, 0.9/r, 1.0/l, 0.7/d, 0.5/s, 0.4/h, 0.6/li }

Q = { 1.0/j, 1.0/r, 0.5/l, 0.2/d, 0.2/s, 0.1/h, 0.4/li }

1) P ∪ Q = { 1.0/j, 1.0/r, 1.0/l, 0.7/d, 0.5/s, 0.1/h, 0.6/li }

2) P ∩ Q = { 0.3/j, 0.9/r, 0.5/l, 0.2/d, 0.2/s, 0.1/h, 0.4/l }

3) P' = { 0.7/j, 0.1/r, 0/l, 0.5/d, 0.5/s, 0.6/h, 0.4/li }

4) Q' = { 0/j, 0/r, 0.5/l, 0.6/d, 0.8/s, 0.9/h, 0.6/li }

5) P - Q = P ∩ Q'

P - Q = { 0/j, 0/r, 0.5/l, 0.7/d, 0.5/s, 0.4/h, 0.6/li }

6) P' ∩ Q' = { 0/j, 0/r, 0.1/l, 0.3/d, 0.5/s, 0.6/h, 0.4/li }.

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Q4 A

2) Membership Function:

→ ① Membership functions were first introduced in 1965 by Lofti A. Zadeh in first research paper "fuzzy sets"

② A function that specifies the degree to which given input belongs to a set is known as Membership Function

③ Membership functions characterize fuzziness, whether the elements in fuzzy sets are discrete or continuous.

④ Membership functions are used in fuzzification and defuzzification steps of a FLS (Fuzzy logic system), to map the non fuzzy input values linguistic and vice versa.

⑤ Membership functions are represented by graphical form.

⑥ Types of Membership functions

a) Increasing MFs (Γ function):

b) Decreasing MFs (L function)

c) Triangular MF (Λ function)

d) Trapezoidal MF (Π function)

e) Gaussian MF

f) Generalized Bell MF / Cauchy MF:

g) Sigmoidal MFs:

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Q4 B

1) Genetic Algorithm

→ (1) Genetic algorithms are part of evolutionary computing, which is a rapidly growing area of Artificial intelligence.

(2) Genetic Algorithms are inspired by Darwin's theory about evolution

(3) It is an intelligent random search technique.

(4) It is used to Solve optimization problems.

(5) Genetic Algorithm uses encode solutions as fixed length "bit strings". Eg: 101110, 111111, 000101

(6) Genetic Algorithm works by testing any strings and getting a score indicating How good that solution is.

(7) The set of all possible solutions [0.... 1000] is called as search space or state space.

Chromosome

(1) In genetic algorithm, a chromosome is a set of parameter which define a proposed Solution to the problem that the genetic algo is ~~trig~~ trying to solve.

(2) The set of al Solutions is known as the population.

Fitness function:

(1) A fitness function is particular type of objective function.

(2) The fitness function is a function which takes a Candidate Solution to the problem as input and produces as output how "fit" or how "good" the solution is with respect to the problem in Consideration.

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Crossover:

① Crossover is also known as recombination

② Crossover is a genetic operator used to combine the genetic information of two parents to generate new off spring.

Mutation:

① Mutation is a genetic operator to maintain genetic diversity from one generation of a population of genetic algorithm chromosomes to the next.

② It is analogous to the biological mutation.