# NATIONAL UNIVERSITY

## Of Computer & Emerging Sciences

Name Muhammad Usman, Muhammad

Roll No 23F-0570, 23F-0577

Section BSCS-6D

Assignment # 2 Part A Artificial Intelligence

## Question 1

Currently be solved using computer OR NOT. why not possible.

i) Drive safely on highway.

Yes:
Already being implemented on highway which is Tesla autopilot.

ii) Drive Safely in busy city with other traffic and pedestrain.

No, not yet because situations are unpredictable as Some cars work for wide lines highway. coming of human suddenly, weather sodden speed breakers.

iii) Buying a week worth of groceries online.

Yes, Amazone is currently perfectly working for groceries and other stuff.

iv) Buying a week worth of groceries at store.

Not, Robots are not completly trained to enter store and buy things if they trained for only one store there may be position of items can be changed.

v) Booking a doctor's appointment online.

Yes, websites like dodoc and apka muaij working in advance countries.

vi) Win Soccer game against human.

NO, AI robot team cannot beat human soccer team physically in real match because they are not traned much for balance.

vii) Win an Art competition.

Yes, AI can beat in Art competition due to excellent image creation.

viii) Win a chess game against human.

Yes, AI has already beaten human in chess like DeepBlue

ix) Discovering and proving new mathematical theorems.
Yes, AI have proven some theorem but did not discover any new one.

x) Giving competent legal advice in a specialize area of law.
No, AI can give suggestions but cannot reliably provide fully competent, special legal advice due to complexity.

xi) Translating spoken urdu to english in real time
Yes, Tools like google Translate perform real time speech.

xii) Writing an ~~fictional~~ intentionally funny story.
Yes, Chatgpt can generate stories.

xiii) Writing a publishable research Article?
No, It can help in draft but can not make complete Article.

## Question #2

Give ~~Yes or NO~~ explanation and wheather true or false.

i) False:
Even with partial information an agent can still be perfectly rational. Because it precieves through senses and act through actuators.
Example: Poker game.

ii) True:
Because pure reflex agents only look at current percept and ignore history.
Example: Chess you must remember only previous moves.

iii) True:
If all actions give the same result then agent is rational.

iv) ~~False~~ True

Agent function is just a rule or idea and need program to implement for world

v) True:

If all actions lead to same outcome.
A room with only one possible outcome.

vi) True:

Because agent selects one preciewe and act the it can be rational.

vii)

False:

If environment is unobservable, some agent perform poor because they cannot sense anything.

viii) ~~false~~ false

Poker involves randomness. It does not always win means not always rations.

## Question 3: PEAS

| Activity | Performanc | Environment | Actuators | Sensors |
|---|---|---|---|---|
| ① Playing Soccer | win match score goods teamwork. | Field ball teammates, opponents, referee, weather | Legs (run/kick) head, body | Eyes, ears body, balance. |
| ② Exploring ocean of Titan | Safety data collection. | Dark cold ocean under Ice, unknown terrain | propellers, drill arms, ~~legs, body~~ | cameras, temperature pressure, sensors |
| ③ Playing Tennis Match | win points and match, follow rules | Court, opponent ball, umpire wether | Arms with racket legs, body | Eyes, ears balance. |

| Activity | Performance | Environment | Actuators | Sensors. |
|---|---|---|---|---|
| ④ Practicing tennis against wall | Improve accuracy and control | wall, ball court | Arms, legs body | eyes, coordination |
| ⑤ Performing high jumper | clear bar succefully | Track, bar landing mat | Legs (jump) arms, body | eyes balance sense |
| ⑥ knitting a sweater | Make sweater correctly without mistakes | yarn, needls sweater | Hands fingers | Eyes touch. |
| ⑦ Bidding at an Auction | win item at lowest price | Aution room, online site bidders autioneer | raise, mouse click | display. |

## Question #4

## Describe as following Environment.

| Activity | Observable | Deterministic/stochastic | Episodic/sequential | Static/dynamic | Discrete/continous | Single/multiple |
|---|---|---|---|---|---|---|
| ① Playing Soccer | Partially observable cant see all player | Stochastic opponent act unpredictably | Sequential moves affect future play | Dynamic player keep moving | continous many possible positions | Multi opponent Team. |
| ② Exploring Ocean of Titan | Partially sensor can't see every-thing | Stochastic Opponent hits unpredictably | Sequential Each step depend on next | Dynamic Ocean condition change | Continuous depth vary | Singl only Robot explores |
| ③ Playing A tennis match | Fully can see ball and court clearly | Stochastic opponent hits unpredictably | Sequential Shot affect next move | Dynamic Ball and players move | Continous Ball and movement of player are | Multi Two player against each other |

| Environment | Practicing Tennis against wall | Performing a high jump | knitting a sweater | Bidding in auction |
|---|---|---|---|---|
| Observable | Fully observable because can see both ball and wall | Fully observable because can see bar and body | Fully Observable because can see yarn and needles | Partial because cant see all bids. |
| Determinsits OR Stochastic | Deterministic because ball bounces same way almost everytime | Deterministic outcome is predictable | Deterministic because patter is predictabl | Stochastic because bids are unpredictable |
| Episodic OR Sequential | sequential because each hit follows last | episodic because each jump independ | Sequential because each stitch affect next | Each bid effect next so sequential |
| Static OR Dynamic | Static because wall does not move | Static because enviroment unchanged | Static yarn and needle don't move | Dynamic other bidders act |
| Discrete OR continuous | Continouse becaus smooth ball movement | Continous because jump heigh varies | Contious ~~and Discrete~~ Not countable stitches | Discrete bids are countabl |
| Singl OR multiple Agent | mult agent because ~~only~~ player acts | Single only jumper | Single only knitters | multi - many bidders |

Question #5

Example of Smart Billing Agent.

i) Reflex Agent.

Reflex agent acts instantly based on current input without memory or reasoning.

Example

1- Bill payment:

If the due date is near it automatically sends reminder.

2. Error Notification.

If the system detects missing data, it immediately shows error.

ii) Model Based Agent.

It uses memory and store data to make better decision.

Example:

Usage Tracking:

It remembers previous electricity usage pattern for each month to compare with current.

Power outages history.

It records when and where power outages occure.

iii) Goal Based Agent

It work step by step to achieve the goal

Example

Pay bill: Agent help the user to login, select bill and complete bill.

Report complaint: It collects complaint detail and sends them To correct department.

iv) Utility Based Agent

Chooses the most efficient or beneficial action from several options.

Example:

Choosing payment method: It gives best payment will less tax based on past usage.

complaint Priority: It gives higher priority to complants from hospitals and school.

## v- Learning Agent

Learning agent learn from experience and improve performance over time.

Example

1- Learning user behaviour: It learns that user usually pays bills on last date and start sending reminder earlier.

2- Predict Usage: It predicts next month usage using past data and seasonal changes.

## Question 6

Describe following Problems depend on following components.

i) Six Glass Boxes Pattern

a) Initial State

You have the key to box 1.
All boxes are unlocked.
Banana is in Inside Box 6

b) Actions

Unlock box (if having key)
Take the key from inside box
Open next box

c) Transition model

Unlock Box(i) → Get key of BOX(i+1)
where i = 1, 2, 3, 4, 5, 6.

d) Goal State

Banana is in your hand

e) Path cost:

1 per unlock action
Total cost = 6

State space

$S_0$(key1, No Banana) → $S_1$ (key2, No Banana) → $S_2$(key3, No Ban

$S_3$(key4, No Banana) → $S_4$ (key5, No Banana) → $S_5$ (key6, No Ban

Goal (key6, Banana)

## ii) 3 coin problem Atleast 2 head

a) Initial state

H-H-H

b) Actions

$Flip_1$ OR $Flip\ C_2$ OR $Flip\ C_3$

c) Transion Model

H to T OR T to H flip

d) Goal State

At least two tails

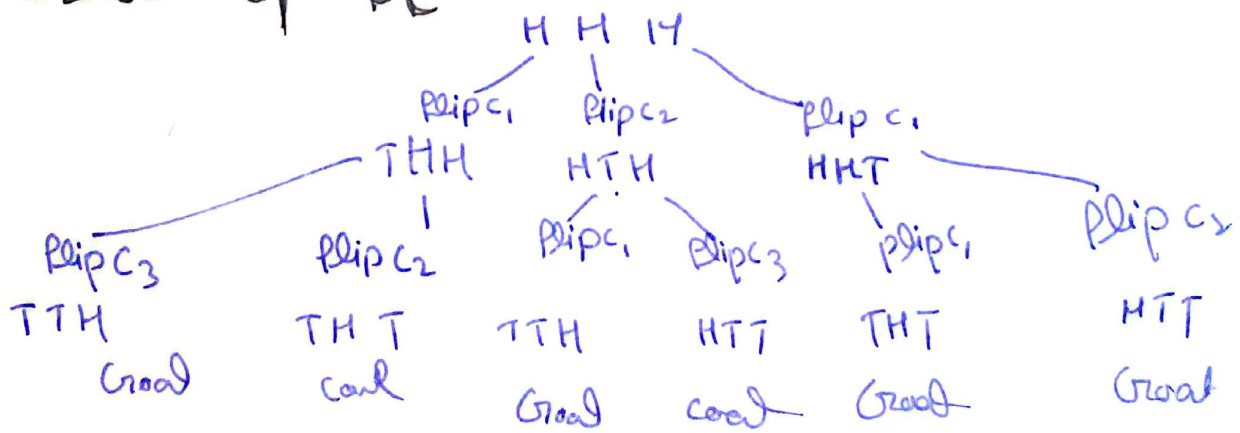
TTH, THT, HTT, TTT

e) Path cost

1 per flip

Minimum cost 2 (we need at least two heads)

## State space



# 3-Missionary And cannibl problem

① All should cross river
② On same side of river missionary count >= canibbles
③ only one boad
④ only two peapl ata time

① Inutial stat

< sideriver, missionar, cannible>

<1,3,3> <2,0,0>

River side 1 River side 2

② Actions:

Boat will carry

1 M
2 M
1 C
2 C
1 M + 1 C

③ Transition Model

All rules given above.

① All should cross rive
② count of missiorg >= cannibles at same side of river

④ Goal state

<1,0,0> <2,3,3>

e) path cost

1 per ~~boat~~ boat crossing

minimum cost = 11

State Space.

<1,3,3> <2,0,0>

<1,3,1> <2,0,2>

<1,3,2> <2,0,1>

<1,3,0> <2,0,3>

<1,3,1> <2,0,2>

<1,1,1> <2,2,2>

<1,2,2> <2,1,1>

<1,0,2> <2,3,1>

<1,0,3> <2,3,0>

<1,0,1> <2,3,2>

<1,0,2> <2,3,1>

<1,0,0> <2,3,3> ✓ Solution