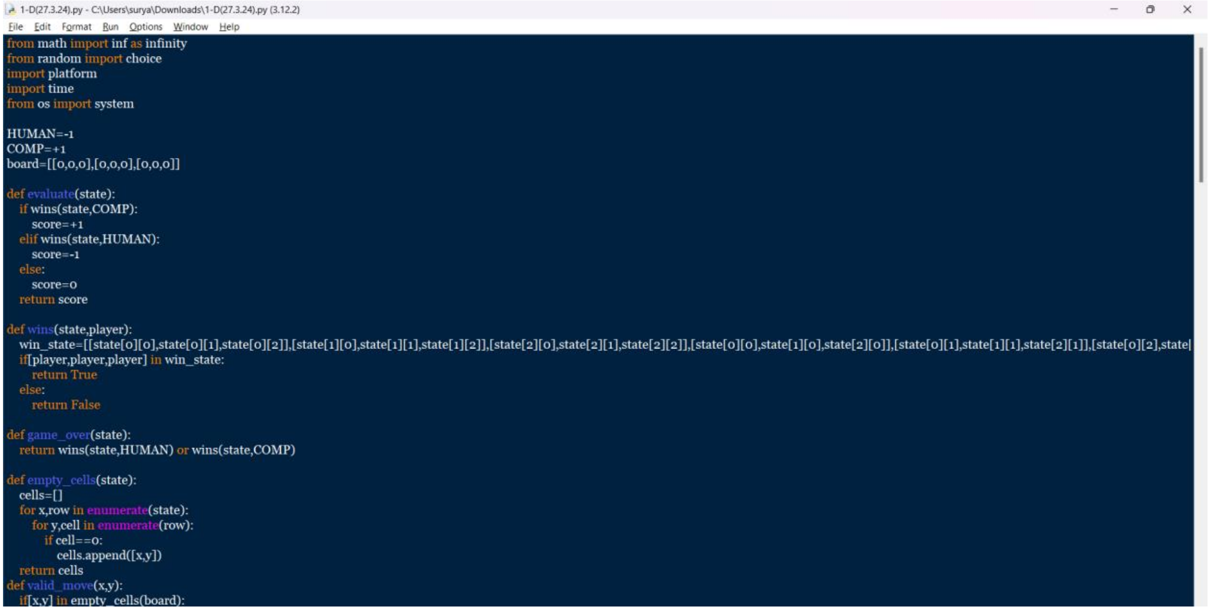
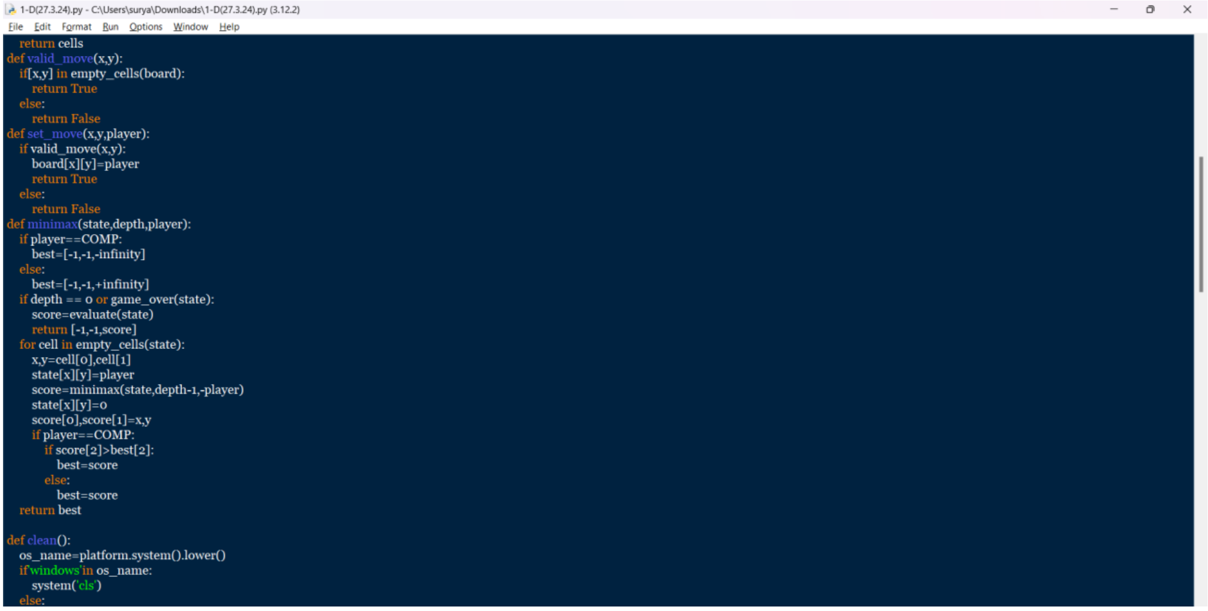
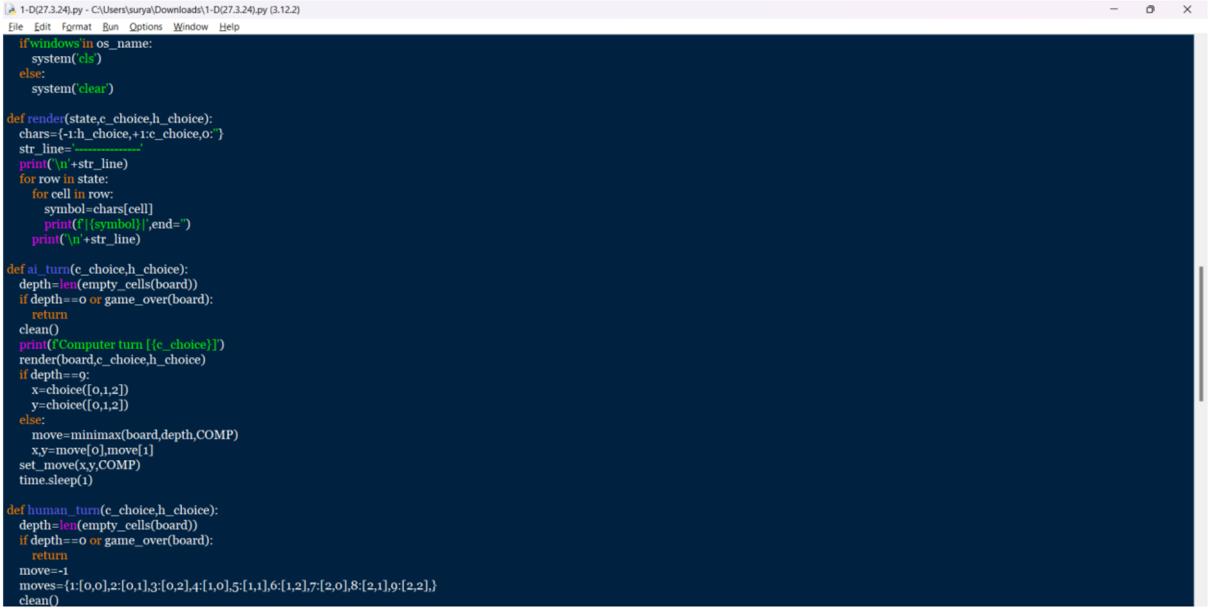

1-D(27.3.24).py - C:\Users\surya\Downloads\1-D(27.3.24).py (3.12.2)
File Edit Format Run Options Window Help

```
from math import inf as infinity
from random import choice
import platform
import time
from os import system

HUMAN=-1
COMP=+1
board=[[0,0,0],[0,0,0],[0,0,0]]

def evaluate(state):
  if wins(state,COMP):
    score=+1
  elif wins(state,HUMAN):
    score=-1
  else:
    score=0
  return score

def wins(state,player):
  win_state=[[state[0][0],state[0][1],state[0][2]],[state[1][0],state[1][1],state[1][2]],[state[2][0],state[2][1],state[2][2]],[state[0][0],state[1][0],state[2][0]],[state[0][1],state[1][1],state[2][1]],[state[0][2],state
  if[player,player,player] in win_state:
    return True
  else:
    return False

def game_over(state):
  return wins(state,HUMAN) or wins(state,COMP)

def empty_cells(state):
  cells=[]
  for x,row in enumerate(state):
    for y,cell in enumerate(row):
      if cell==0:
        cells.append([x,y])
  return cells
def valid_move(x,y):
  if[x,y] in empty_cells(board):
```


1-D(27.3.24).py - C:\Users\surya\Downloads\1-D(27.3.24).py (3.12.2)
File Edit Format Run Options Window Help

```
  return cells
def valid_move(x,y):
  if[x,y] in empty_cells(board):
    return True
  else:
    return False
def set_move(x,y,player):
  if valid_move(x,y):
    board[x][y]=player
    return True
  else:
    return False
def minimax(state,depth,player):
  if player==COMP:
    best=[-1,-1,-infinity]
  else:
    best=[-1,-1,+infinity]
  if depth == 0 or game_over(state):
    score=evaluate(state)
    return [-1,-1,score]
  for cell in empty_cells(state):
    x,y=cell[0],cell[1]
    state[x][y]=player
    score=minimax(state,depth-1,-player)
    state[x][y]=0
    score[0],score[1]=x,y
    if player==COMP:
      if score[2]>best[2]:
        best=score
      else:
        best=score
  return best

def clean():
  os_name=platform.system().lower()
  if'windows'in os_name:
    system('cls')
  else:
```


1-D(27.3.24).py - C:\Users\surya\Downloads\1-D(27.3.24).py (3.12.2)
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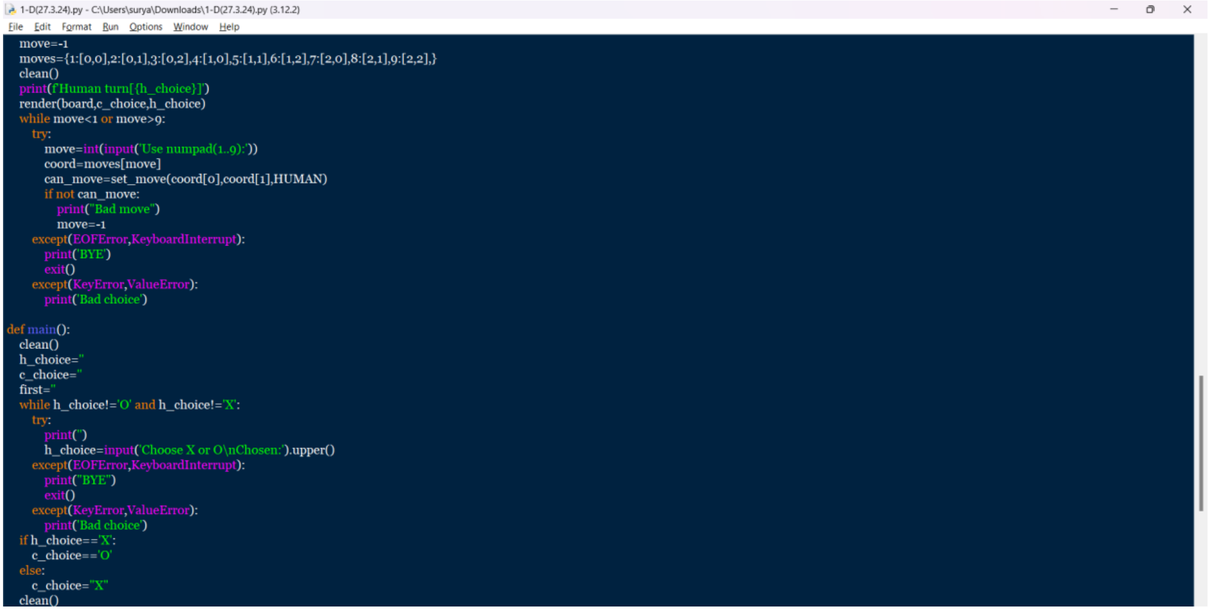
```
    if'windows'in os_name:
        system('cls')
    else:
        system('clear')

def render(state,c_choice,h_choice):
    chars={-1:h_choice,+1:c_choice,0:''}
    str_line='---------------'
    print('\n'+str_line)
    for row in state:
        for cell in row:
            symbol=chars[cell]
            print(f'|{symbol}|',end='')
        print('\n'+str_line)

def ai_turn(c_choice,h_choice):
    depth=len(empty_cells(board))
    if depth==0 or game_over(board):
        return
    clean()
    print(f'Computer turn [{c_choice}]')
    render(board,c_choice,h_choice)
    if depth==9:
        x=choice([0,1,2])
        y=choice([0,1,2])
    else:
        move=minimax(board,depth,COMP)
        x,y=move[0],move[1]
    set_move(x,y,COMP)
    time.sleep(1)

def human_turn(c_choice,h_choice):
    depth=len(empty_cells(board))
    if depth==0 or game_over(board):
        return
    move=-1
    moves={1:[0,0],2:[0,1],3:[0,2],4:[1,0],5:[1,1],6:[1,2],7:[2,0],8:[2,1],9:[2,2],}
    clean()
```


1-D(27.3.24).py - C:\Users\surya\Downloads\1-D(27.3.24).py (3.12.2)
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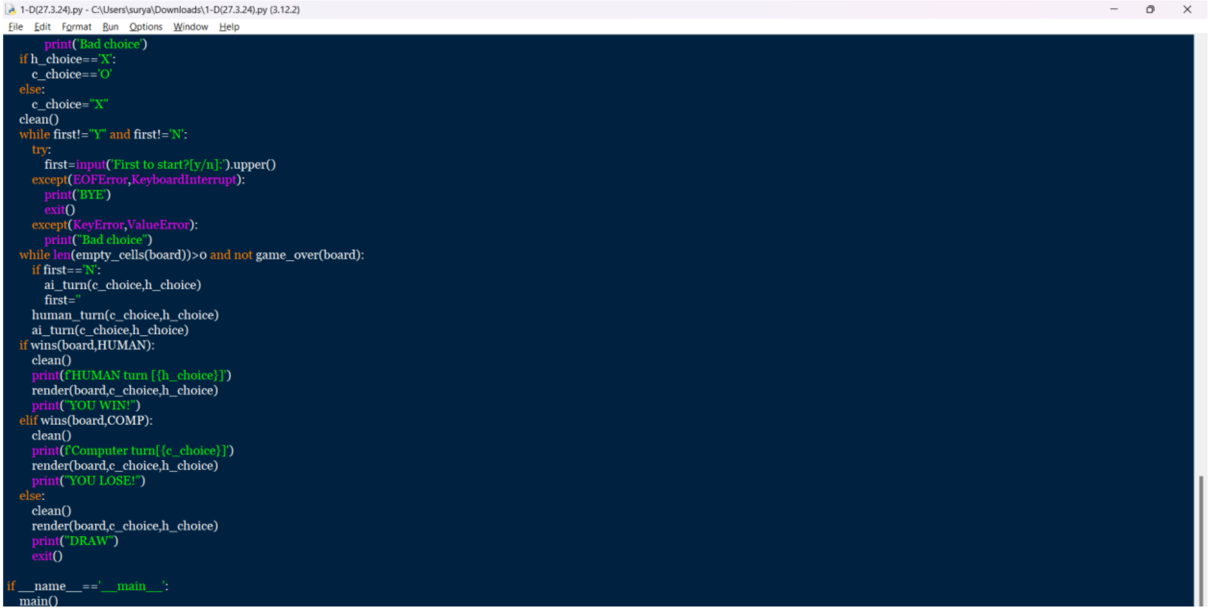
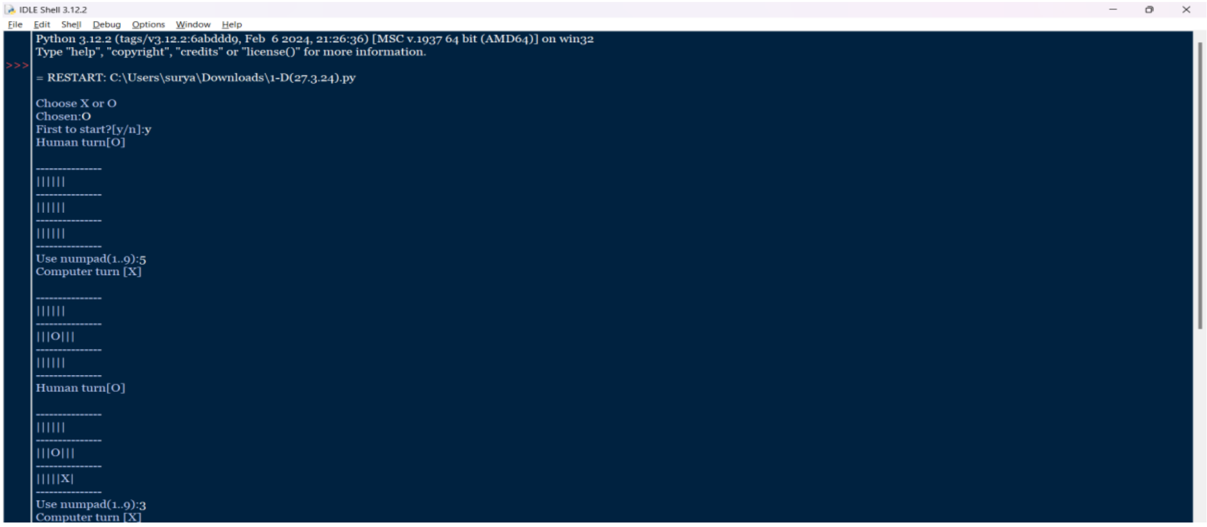
```
    move=-1
    moves={1:[0,0],2:[0,1],3:[0,2],4:[1,0],5:[1,1],6:[1,2],7:[2,0],8:[2,1],9:[2,2],}
    clean()
    print(f'Human turn[{h_choice}]')
    render(board,c_choice,h_choice)
    while move<1 or move>9:
        try:
            move=int(input('Use numpad(1..9):'))
            coord=moves[move]
            can_move=set_move(coord[0],coord[1],HUMAN)
            if not can_move:
                print("Bad move")
                move=-1
        except(EOFError,KeyboardInterrupt):
            print('BYE')
            exit()
        except(KeyError,ValueError):
            print('Bad choice')

def main():
    clean()
    h_choice=''
    c_choice=''
    first=''
    while h_choice!='O' and h_choice!='X':
        try:
            print('')
            h_choice=input('Choose X or O\nChosen:').upper()
        except(EOFError,KeyboardInterrupt):
            print("BYE")
            exit()
        except(KeyError,ValueError):
            print('Bad choice')
    if h_choice=='X':
        c_choice=='O'
    else:
        c_choice="X"
    clean()
```


1-D(27.3.24).py - C:\Users\surya\Downloads\1-D(27.3.24).py (3.12.2)
File Edit Format Run Options Window Help

```
            print('Bad choice')
    if h_choice=='X':
        c_choice=='O'
    else:
        c_choice="X"
    clean()
    while first!="Y" and first!='N':
        try:
            first=input('First to start?[y/n]:').upper()
        except(EOFError,KeyboardInterrupt):
            print('BYE')
            exit()
        except(KeyError,ValueError):
            print("Bad choice")
    while len(empty_cells(board))>0 and not game_over(board):
        if first=='N':
            ai_turn(c_choice,h_choice)
            first=''
        human_turn(c_choice,h_choice)
        ai_turn(c_choice,h_choice)
    if wins(board,HUMAN):
        clean()
        print(f'HUMAN turn [{h_choice}]')
        render(board,c_choice,h_choice)
        print("YOU WIN!")
    elif wins(board,COMP):
        clean()
        print(f'Computer turn[{c_choice}]')
        render(board,c_choice,h_choice)
        print("YOU LOSE!")
    else:
        clean()
        render(board,c_choice,h_choice)
        print("DRAW")
        exit()

if __name__=='__main__':
    main()
```



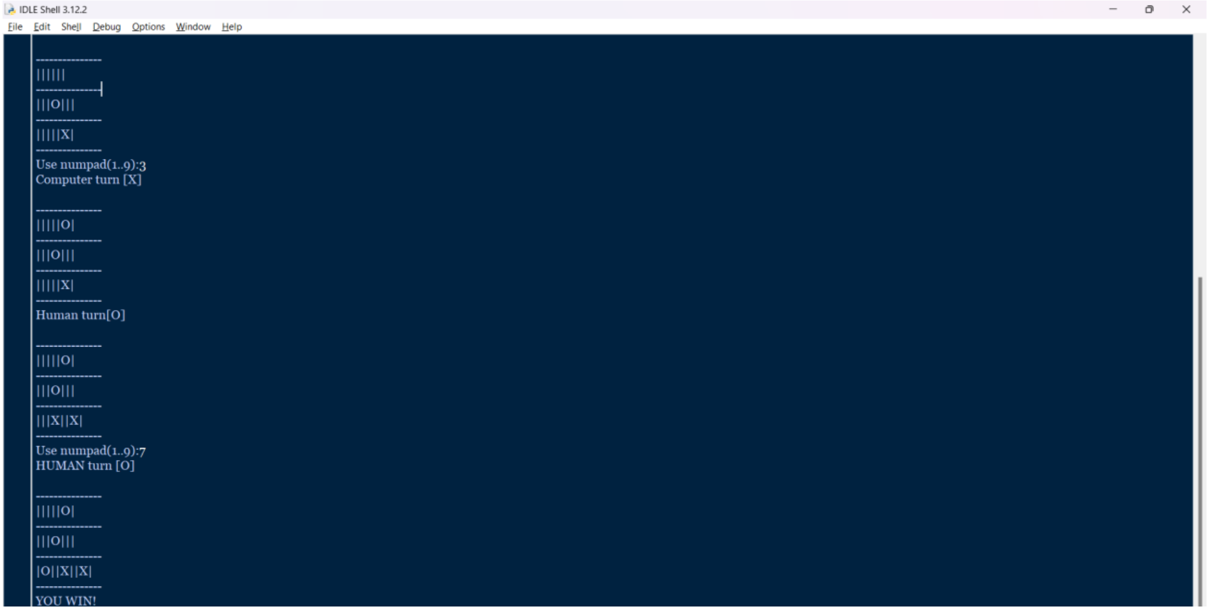
```
    Python 3.12.2 (tags/v3.12.2:6abddd9, Feb  6 2024, 21:26:36) [MSC v.1937 64 bit (AMD64)] on win32
    Type "help", "copyright", "credits" or "license()" for more information.
>>>
    = RESTART: C:\Users\surya\Downloads\1-D(27.3.24).py

    Choose X or O
    Chosen:O
    First to start?[y/n]:y
    Human turn[O]

    ---------------
    ||||||
    ---------------
    ||||||
    ---------------
    ||||||
    ---------------
    Use numpad(1..9):5
    Computer turn [X]

    ---------------
    ||||||
    ---------------
    |||O|||
    ---------------
    ||||||
    ---------------
    Human turn[O]

    ---------------
    ||||||
    ---------------
    |||O|||
    ---------------
    |||||X|
    ---------------
    Use numpad(1..9):3
    Computer turn [X]
```



```

---------------
||||||
---------------
|||O|||
---------------
|||||X|
---------------
Use numpad(1..9):3
Computer turn [X]

---------------
|||||O|
---------------
|||O|||
---------------
|||||X|
---------------
Human turn[O]

---------------
|||||O|
---------------
|||O|||
---------------
|||X||X|
---------------
Use numpad(1..9):7
HUMAN turn [O]

---------------
|||||O|
---------------
|||O|||
---------------
|O||X||X|
---------------
YOU WIN!
```