Graphic Era
HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

Mid Term (Odd) Semester Examination October 2024

Roll no.................................

Name of the Course and semester: MCA 3rd Semester
Name of the Paper: Artificial Intelligence & Machine Learning
Paper Code: TMC-303
Time: 1.5 hour

Maximum Marks: 50

Note:
(i) Answer all the questions by choosing any one of the sub questions
(ii) Each question carries 10 marks.

Q1.   (10 Marks)
a. What is the rational agent approach to AI? How is this approach different from other approaches to AI? Discuss the characteristics of a rational agent in the context of an AI system.   (CO1)

OR

b. What is the Hill Climbing algorithm? Discuss the basic concept and limitations of hill climbing in AI. Solve the following numerical example using hill climbing: Maximize the function $f(x)=-x^2+6x-5$. Start with an initial guess $x=2$.
                                                                                             (CO2)

Q2.   (10 Marks)
a. Define state-space search in the context of AI. How is the state-space search used to model problem-solving processes in AI? Provide a diagram to illustrate a simple state-space search problem.   (CO1)

OR

b. Explain the concept of control strategies in production systems. Discuss the differences between blind and informed search control strategies, and provide examples of each.
                                                                                             (CO2)

Q3.   (10 Marks)
a. Explain what is meant by problem spaces in AI. Discuss how problems can be formulated in terms of states, actions, goals, and operators. Provide an example of a problem and its corresponding problem space.
                                                                                             (CO1)

OR

b. Explain the Best-First Search algorithm. How does it differ from BFS and DFS? Solve the following problem using Best-First Search:
                                                                                             (CO2)
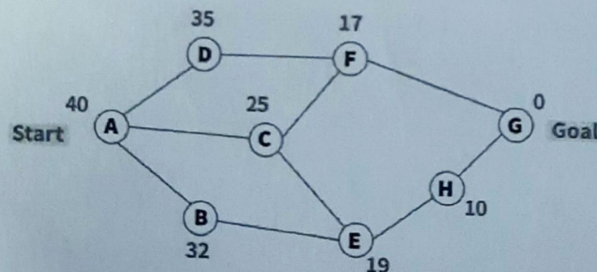
Q4.   (10 Marks)
a. Compare and contrast the Turing Test approach and the Rational Agent approach to AI. Which one is more suited to modern AI systems? Justify your answer with examples.
                                                                                             (CO1)

OR

b. What is a Constraint Satisfaction Problem (CSP)? Explain how CSPs can be solved using search algorithms. Solve the given problem using CSP. (S E N D + M O R E = M O N E Y).
                                                                                             (CO2)

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Q5.   (10 Marks)

a. Explain the concept of a production system in AI. What are the key components of a production system? Provide an example of a production system to solve a simple problem.   (CO1)

<div align="center">OR</div>

b. Compare and contrast BFS and DFS in terms of completeness, optimality, time complexity, and space complexity. Provide examples of problems where BFS is more suitable and others where DFS performs better.   (CO2)