Question Paper

Exam Date & Time: 08-Dec-2023 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

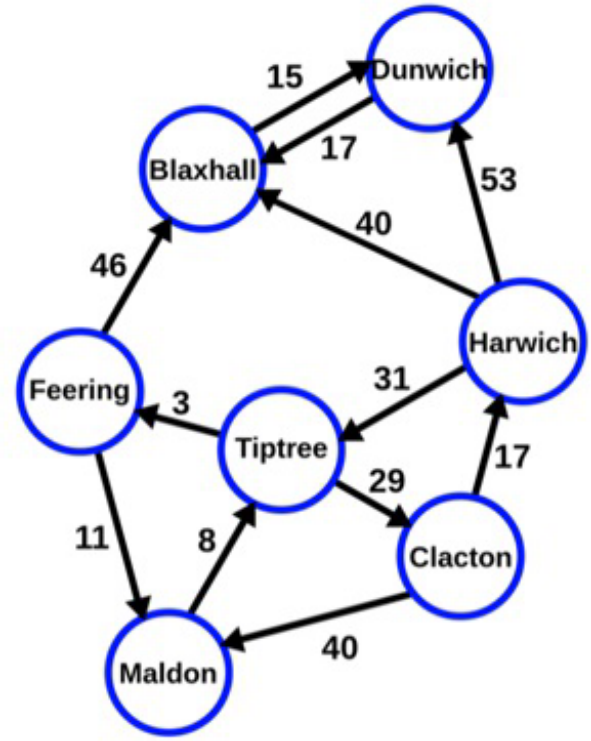
INTERNATIONAL CENTRE FOR APPLIED SCIENCES
END SEMESTER THEORY EXAMINATIONS NOVEMBER/DECEMBER 2023
III SEMESTER BSc(APPLIED SCIENCES) IN ENGG.

ARTIFICIAL INTELLIGENCE [ICS 236 - S2]

Marks: 50 **Duration: 180 mins.**

Answer ALL the questions.
Missing data may be suitably assumed.

1)	A)	List and discuss the various disciplines that acted as the foundations of artificial intelligence.	(5)
	B)	Differentiate simple reflex agent and model based agents with suitable diagrams.	(5)
2)	A)	Rob is planning to move this summer from Harwich to Maldon. In the graph below, the vertices represents towns and the edges represent the cost of tolls that needs to be paid while travelling from one town to another. Rob needs to your advice in planning the trip; he wants to minimize the total amount paid for tolls. What route do you think he should take and how much would he have to pay over the entire journey tolls? Identify the best algorithm to solve given problem.	(5)



B) Discuss the 5 phases of genetic algorithm with a neat flow diagram? (5)

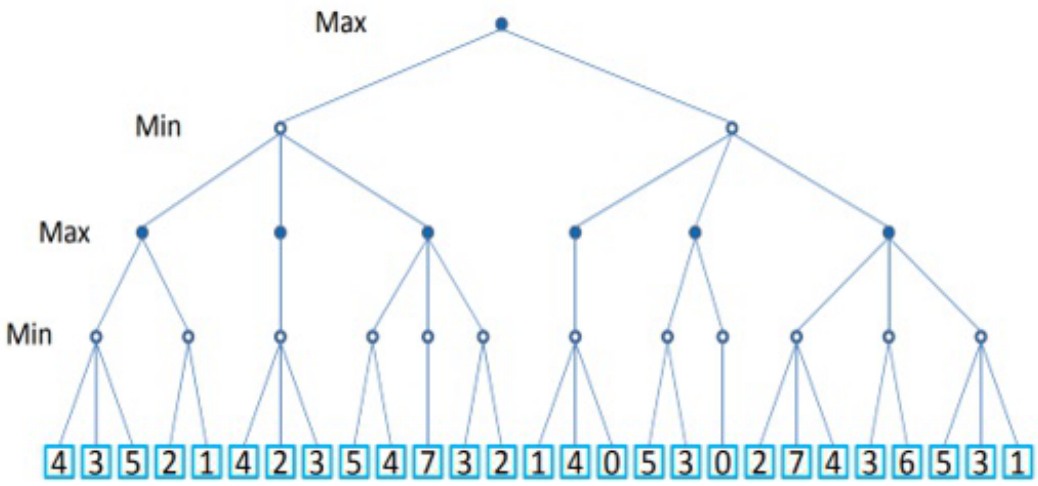
3) Solve the following cryptarithmetic problem using Constraint Satisfaction Problem logic. CROSS + ROADS = DANGER. (5)

A) Constraints:

i) Each Letter, Symbol represents only one digit throughout the problem.

ii) The value for each letter is ranging between (0 to 9)

B) Perform the minimax algorithm for given problem and show the optimal path. (5)



4) What is the difference between predicate logic and propositional logic? (5)

A) Represent the following statements using predicate logic.

i) A person born outside the UK, one of whose parents is a UK citizen by birth, is a UK citizen by descent.

ii) A person born in the UK, each of whose parents is a UK citizen or a UK resident, is a UK citizen by birth.

iii) There is an agent who sells policies only to people who are not insured.

B) i) The below axiom states that if an event e happens over the time interval *(t1, t2)*, and e initiates a fluent *f* at time *t1*, and *f* is not clipped (ceases to be true) during the interval *(t1, t)*, and *t* is a time after *t1*, then *f* is true at time *t*. Justify the below axiom with an example. (5)

$Happens(e, (t1, t2)) \wedge Initiates(e, f, t1) \wedge Clipped(f, (t1, t)) \wedge t1 < t \Rightarrow T(f, t)$

ii) The below axiom states that if an event *e* happens over the time interval *(t1, t2),* and e initiates a fluent *f* at time *t1,* and *f* is not clipped (ceases to be true) during the interval *(t1, t)*, and *t* is a time after *t1*, then *f* is false at time *t*. Justify the below axiom with an example.

$Happens(e, (t1, t2)) \wedge Terminates(e, f, t1) \wedge Restored(f, (t1, t)) \wedge t1 < t \Rightarrow T(f, t)$

5) A) Given that a doctor knows that meningitis causes a stiff neck 50% of the time, and the prior probability of a patient having meningitis is 1/40,000, and the prior probability of any patient having a stiff neck is 2%. Let s be the proposition that the patient has a stiff neck and m be the proposition that the patient has meningitis. What is the likelihood of the patient having meningitis given the presence of a stiff neck symptom? Use Bayes' rule to calculate the probability of disease given symptoms. (5)

B) Below is an example of a full joint distribution for the toothache, cavity, and catch worlds, and it describes the presence or absence of cavities in a patient with a toothache. The probabilities in the table represent the likelihood of each possible combination of the variables. (5)
Computer conditional probabilities P(Toothache | cavity) and P(toothache ∨ catch) using Bayes Theorem.

	toothache		*¬toothache*	
	catch	*¬catch*	*catch*	*¬catch*
cavity	0.108	0.012	0.072	0.008
¬cavity	0.016	0.064	0.144	0.576

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