EAST WEST UNIVERSITY
Department of Computer Science and Engineering
B.Sc. in Computer Science and Engineering Program
Final Examination, Summer 2023 Semester

Course:	**CSE 365, CSE 366, ETE475, ICE475, ICE 476 Artificial Intelligence, Section-4**
Instructor:	**Dr Md Rifat Ahmmad Rashid, Assistant Professor, Department of CSE**
Full Marks:	**30**
Time:	**1 Hour and 20 Minutes**

Notes:
There are FIVE questions, answer ALL of them. Course Outcome (CO), Cognitive Level (C), and Mark of each question are mentioned at the right margin.

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1. Find whether the meaning of the statement is true or false using propositional logic. [CO3.C3 Marks: 4]
   "If the earth moves round the sun or the sun moves round the earth, then Copernicus might be a mathematician but was not an astronomer."

2. For each pair of atomic sentences, give the most general unifier (MGU) if it exists: [CO3,C3 Marks: 6]
   a. P (A, B, B), P (x, y, z).
   b. Q (y, G (A, B)), Q (G (x, x), y).
   c. Older (Father (y), y), Older (Father (x), John).
   d. Knows (Father (y), y), Knows (x, x).
   e. Color(Chair, Blue), Color(x, y)
   f. Has(Pet, Dog), Has(x, Cat)

3. A knowledge base contains the following statements: [CO3, C3 Marks: 2+2+4]
   a) Everyone who loves all animals is loved by someone.
   b) Anyone who kills an animal is loved by no one.
   c) Jack loves all animals.
   d) Either Jack or Curiosity killed the cat, who is named Tuna.
   e) Tuna is loved by everyone.
   f) Jack loves Tuna.

   Convert these statements into First Order Logic (FOL) by considering original sentences, some background knowledge, and the negated goal in FOL.

   Then convert each FOL statement into CNF form.

   Finally, use resolution to **prove** that "**Curiosity killed the cat**." Hint: Use proof by contradiction and resolution graph.

4. Consider the following statements. [CO3,C3 Marks:2+ 2+2]
   a) It is a crime for an American to sell weapons to hostile nations.
   b) The country Nono, an enemy of America, has some missiles.
   c) All of its missiles were sold to it by Colonel West.
   d) Missiles are weapons.
   e) An enemy of America counts as "hostile".
   f) Colonel West is American.
   g) The country Nono, an enemy of America.

Convert these statements into First Order Logic (FOL) by considering original sentences, some background knowledge. Use forward or backward chaining inference to prove that **"Robert is criminal."**

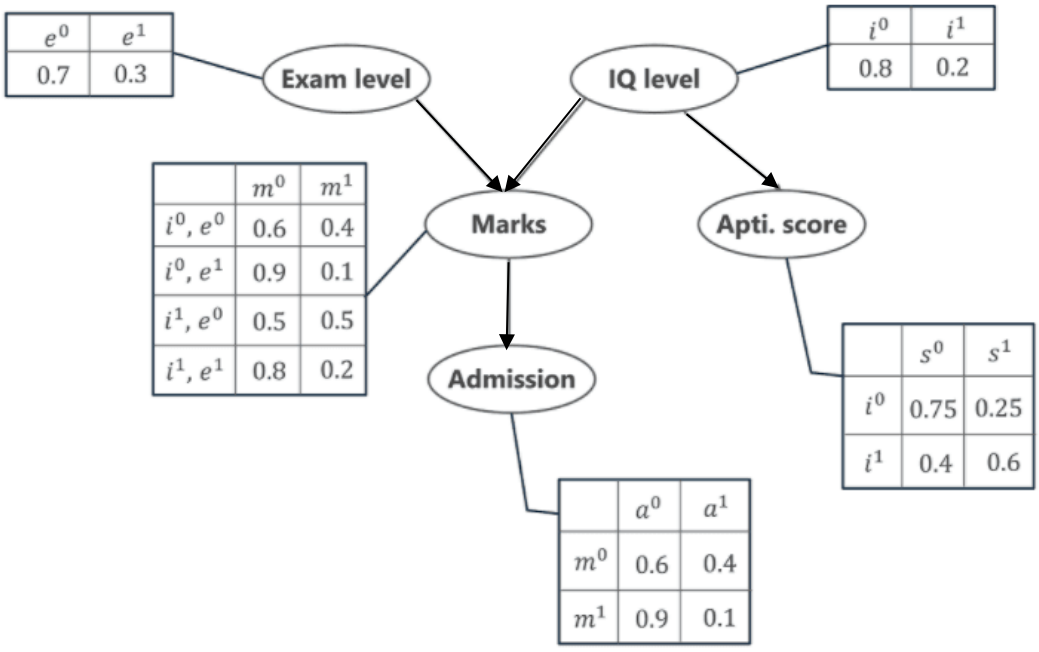
5. Let us imagine that we are given the task of modeling a student's marks (m) for the admission test he has just given. From the given Bayesian Network Graph below, we see that the marks depend upon two other variables. They are, [CO3, C3 Marks: 2+2+2]

- Exam Level (e)– This discrete variable denotes the difficulty of the exam and has two values (0 for easy and 1 for difficult)
- IQ Level (i) – This represents the Intelligence Quotient level of the student and is also discrete in nature having two values (0 for low and 1 for high)

Additionally, the IQ level of the student also leads us to another variable, which is the Aptitude Score of the student (s). Now, with marks the student has scored, he can secure admission to a particular university. Consider the following cases:

a) Calculate the probability that, despite the exam being difficult, a student with low IQ and a low Aptitude Score passes the exam and secures admission to the university.
b) Calculate the probability that a student with a high IQ level and a high Aptitude Score, facing an easy exam, fails to pass and does not secure admission to the university.
c) Calculate the probability that a student with a high IQ level, facing a difficult exam, and having a high Aptitude Score successfully secures admission to the university.

The probability distribution for getting admitted (a) to a university is given below.



e^0	e^1
0.7	0.3

i^0	i^1
0.8	0.2

	m^0	m^1
i^0, e^0	0.6	0.4
i^0, e^1	0.9	0.1
i^1, e^0	0.5	0.5
i^1, e^1	0.8	0.2

	s^0	s^1
i^0	0.75	0.25
i^1	0.4	0.6

	a^0	a^1
m^0	0.6	0.4
m^1	0.9	0.1