

| Reg. Number: |  |
| --- | --- |

**Continuous Assessment Test (CAT-2) - OCTOBER 2024**

| Programme | : | B.Tech  **(**CSE with Specialization) | Semester | : | FALL 2024-25 |
| --- | --- | --- | --- | --- | --- |
| Course Code &  Course Title | : | BCSE306L  Artificial Intelligence | Slot | : | C1+TC2 |
| Faculty | : | Dr. VERGIN RAJA SAROBIN M  Dr. RABINDRA KUMAR SINGH  Dr. VIJAYAKUMAR KP  Dr. KAVITHA J C  Dr. VIJAYAPRABAKARAN K  Dr. ABIRAMI S  Dr. POONKODI  Dr. SANKAR P | Class Number | : | CH2024250102604  CH2024250101681  CH2024250101698  CH2024250101692  CH2024250101686  CH2024250102608  CH2024250101034  CH2024250100578 |
| Duration | : | 1 ½ hours | Max. Mark |  | 50 |
| **General Instructions:**   * Write only your registration number on the question paper in the box provided and do not write other information. | | | | | |
| **Answer all questions** | | | | | |

| Q. No | Sub Sec. | Description | Marks |
| --- | --- | --- | --- |
| 1 |  | Game Tree  The **optimal path** for Player 1 is: **(0,0) → (1,0) → (2,0)**.  The final score after Player 1’s optimal path is **7**. |  |
| 2 | i)  ii) | (i)Translate the following Propositional Logic to English sentences. (3)  Let: p: Umama is eating  • q=Umama is hungry  (a) p ⇒ ¬q  Answer: If Umama is eating, then Umama is not hungry  (b) p ∧ ¬q  Answer: Umama is eating and not hungry  (c) ¬(p ⇒ ¬q)  Answer: Umama is hungry and eating    (ii) Consider the following scenario. When asked for the three children ages of Mrs. Deboeah, she says that Aaron is her youngest child if Bosco is not her youngest child, and that Aaron is not her youngest child if Carl is not her youngest child. Write down a knowledge base that describes the above scenario and the necessary knowledge to show that only one of the three children can be her youngest child.  Show with resolution that Bosco is her youngest child.(7)  Answer: Let the propositions A, B and C denote that Mrs. Deborah’s youngest child is Aaron, Bosco and Carl, respectively.  We have the following clauses for the knowledge:  1 A ∨ B ∨ C (One child has to be the youngest.)  2 ¬A ∨ ¬B (Aaron and Bosco cannot both be the youngest.)  3 ¬A ∨ ¬C  4 ¬B ∨ ¬C The following clauses represent the information from Mrs. Deborah:  5 B ∨ A (Aaron is her youngest child if Bosco is not her youngest child. That is, ¬B ⇒ A.)  6 C ∨ ¬A (Aaron is not her youngest child if Carl is not her youngest child. That is, ¬C ⇒ ¬A.) We want to show that Bosco is the youngest child. Negating this, we get the following clause:  7 ¬B (Assume that Bosco is not the youngest child.) We use resolution to derive the empty clause as follows:  8 (from 5,7) A  9 (from 3,6) ¬A  10 (from 8,9) ⊥ | 10 |
| 3 | i)  ii)  iii) | Step 1: Convert English statements into First-Order Logic (FOL)  Predicates:  ● Parrot(x) : x is a parrot.  ● Bird(x) : x is a bird.  ● Oviparous(x) : x is oviparous.  ● WarmBlooded(x) : x is warm-blooded.  ● Owner(y,x) : y is the owner of x.  ● Pet(x) : x is a pet.  ● Loves(x,y) : x loves y.  ● Hates(x,y) : x hates y.  ● Aditya : A constant representing Aditya.  ● Munna : A constant representing Munna.  FOL Representation:  1. ∀x (Parrot(x) → Bird(x))  2. ∀x (Bird(x) ∧ Oviparous(x) → WarmBlooded(x))  3. Owner(Aditya, Munna)  4. ∀x (Parrot(x) ∧ ∃y Owner(x,y) → Pet(x))  5. ∃x ∃y (Parrot(x) ∧ Owner(y,x))  6. ∀x ∀y (Hates(y,x) ∧ Parrot(x) → ¬Loves(y,x))  7. ∀x ∀y (Bird(x) ∧ Loves(x,y) ∧ Owner(x,y) → ¬ Hates(y,x))  8. Parrot(Munna) ∧ Oviparous(Munna)  Step 2: Convert FOL statements into Conjunctive Normal  Form (CNF)  Now we will convert each FOL statement into Conjunctive Normal Form  (CNF):  1. ¬ Parrot(x) ∨ Bird(x)  2. ¬ Bird(x) ∨ ¬ Oviparous(x) ∨ WarmBlooded(x)  3. Owner(Aditya, Munna)  4. ¬ Parrot(x) ¬ Owner(y,x) Pet(x)  5. Parrot(x) Owner(y, x)  6. ¬ Owner(y,x) ∨ ¬ Hates(y,x) ¬ Parrot(x) ¬ Loves(y,x)  7. ¬ Bird(x) ¬ Loves(x,y) ¬ Owner(y,x) ¬ Hates(y,x)  8. Parrot(Munna) Oviparous(Munna)  Step 3: List all the CNF clauses  1. ¬ Parrot(x) Bird(x)  2. ¬ Bird(x) ¬ Oviparous(x) WarmBlooded(x)  3. Owner(Aditya, Munna)  4. ¬ Parrot(x) ¬ Owner(x,y) Pet(x)  5. Parrot(x)  6. Owner(y, x)  7. ¬ Owner(y,x) ∨ ¬ Hates(y,x) ¬ Parrot(x) ¬ Loves(y,x)  8. ¬ Bird(x) ¬ Loves(x,y) ¬ Owner(y,x) ¬ Hates(y,x)  9. Oviparous(Munna)  10. Parrot(Munna)  Step 4: Unification and Resolution  We aim to prove whether Aditya loves Munna (i.e., Loves(Aditya,Munna)).  11. From statements 3 &amp; 6 Sub: Ɵ = {x/Munna, y/Aditya}  12. From statements 1 &amp; 5 Bird(Munna)  13. From statements 12 &amp; 8 ¬ Loves(Munna, Aditya)  ¬ Owner(Aditya, Munna) ¬ Hates(Aditya, Munna)  14. From statements 13 &amp; 6 ¬ Loves(Munna, Aditya)  ¬ Hates(Aditya, Munna)  So, it is NOT resolved that Aditya loves Munna. |  |
| 4 |  | 1. I. P(B,I,M) = P(B)P(I)P(M) is False, as it would need I ⫫ B ⫫ M II. P(J | G) = P(J | G,I) is True, as J ⫫ I | G. 2. P(b,i,¬m,g,j) = P(b)P(¬m)P(i | b,¬m)P(g | b,i,¬m)P(j | g) = 0.9×0.9×0.5×0.8×0.9 ≈ 0.2916 3. Solution is |  |