Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL 576104

(Constituent College of Manipal University)

SIXTH SEMESTER B.TECH(IT,CCE) DEGREE END SEMESTER EXAMINATION-MAY 2016
SUBJECT:ELECIVE-I ARTIFICIAL INTELLIGENCE & APPLICATION (ICT 328)
(REVISED CREDIT SYSTEM)

TIME: 3 HOURS **11/05/2016** **MAX. MARKS: 50**

Instructions to candidates

- Answer any **FIVE FULL** questions. All questions carry equal marks.
- Missing data if any, may be suitably assumed.

1A. List and describe properties of various task environments.

1B. Define the following

i) intelligence

ii) artificial intelligence

iii) agent

iv) rationality

v) logical reasoning

1C. What is the major limitation of A^* algorithm? Describe a technique to overcome that limitation.

[5+3+2]

2A. Consider the *vacuum-cleaner world*, and assume that the agent's percepts provide no information at all, i.e., you have a sensorless problem. Give six tuple searching problem formulation for such an environment. Give all the related equation or expression while formulating your problem.

2B. Use AC-3 algorithm to show that arc consistency detect the inconsistency of the partial assignment {WA=green, V=red} for the problem shown in Figure Q.2B.

2C. Give the `pseudocode` for *alpha-beta pruning*.

[5+3+2]

3A. Discuss various techniques and their limitations for checking the logical entailment,

$$KB \models \alpha$$

.

3B. Write down logical representations for the following sentences, suitable for use with Generalized Modus Ponens:

i) Horses, cows, and pigs are mammals

ii) An offspring of a horse is a horse

iii) Bluebeard is a horse

iv) Bluebeard is Charlie's parent

v) Offspring and parent are inverse relations

vi) Every mammal has a parent

3C. Consider the sentence, "*Andy and Paul has the same maternal grandmother*," . Write the given sentence in first-order logic. Use the following predicates:

$M(x, y)$: x is mother of y

a: Andy

p: Paul

[5+3+2]

4A. How can you use planning as first-order logical deduction? Consider Wumpus world as an example for your arguments.

4B. Consider the sequent, $(p \wedge q) \wedge r, s \wedge t \vdash q \wedge s$.

i) Convert the given sequent into clausal form

ii) Using resolution principle, show that the given sequent is valid.

4C. What do you understand by the following terms?

i) Pure and impure substitution in first-order logic

ii) Composable and noncomposable with respect to substitution σ and τ.

[5+3+2]

5A. Here are two sentences in the language of first-order logic:

ϕ :$\forall x \exists y(x \geq y)$

ψ :$\exists y \forall x(x \geq y)$

i) Using resolution, try to prove that ϕ follows from ψ. Do this even if you think that ψ does not logically entail ϕ; continue until the proof break down and you cannot proceed (if it break down). Show the unifying substitution for each resolution step. If the proof fails, explain exactly where, how, and why it break down.

ii) Prove that ψ follows from ϕ.

5B. Give the `pseudocode` for Horn's algorithm. Also check satisfiability of the following Horn formulae.

i) $(p_5 \rightarrow p_{11}) \wedge (p_2 \wedge p_3 \wedge p_5 \rightarrow p_{13}) \wedge (\top \rightarrow p_5) \wedge (p_5 \wedge p_{11} \rightarrow \bot)$

ii) $(p \wedge q \wedge s \rightarrow \bot) \wedge (q \wedge r \rightarrow p) \wedge (\top \rightarrow s)$

5C. Suppose you have an oracle, $OM(s)$, that correctly predicts the opponent's move in any state. Using this, formulate the definition of a game as single agent search problem.

[5+3+2]

6A. Consider a knowledge-engineering problem for the circuit given in Figure Q.6A. List the generic steps involved in knowledge engineering, and express the following axioms to your knowledge base in first-order logic

i) If two terminals are connected, then they have the same signal

ii) The signal at every terminal is either 1 or 0

iii) Connected is commutative

iv) There are four types of gates

v) An AND gate's output is 0 if and only if any of its input is 0.

Consider the standard ontology for this problem.

6B. Give a PDDL description of a air cargo transportation problem.

6C. What do you understand, when someone gives following statement about an algorithm?

i) Optimal

ii) Complete

iii) Semi-decidable

iv) Decidable

[5+3+2]

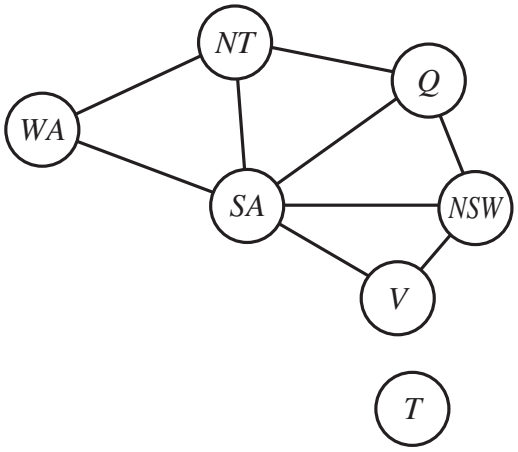

Figure: Q.2B

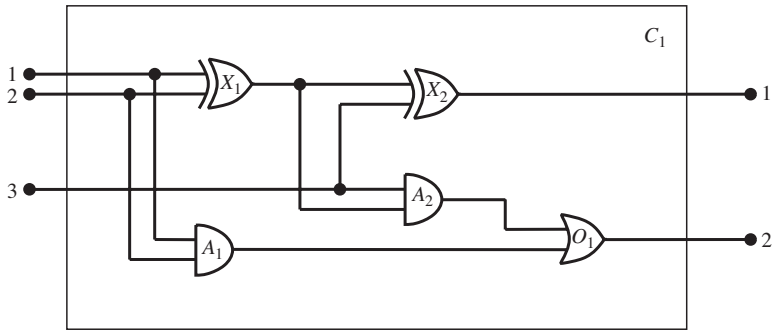

Figure: Q.6A