MCA/4TH SEM/MCAP 2204/2019

INTELLIGENT SYSTEMS

(MCAP 2204)

Time Allotted : 3 hrs   Full Marks : 70

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candid...

Group – A

1. Choose the correct alternative for the following: **10 × 1 = 10**

(viii) Semantic network is
   (a) data type
   (b) a way of representing knowledge
   (c) data structure
   (d) database.

(ix) The region in the state space of a 'Hill Climbing Problem' where all the adjoining nodes have same objective functional value is known as
   (a) plateau
   (b) ridge
   (c) local maxima
   (d) goal.

(x) Which of the following is a Epigram ...
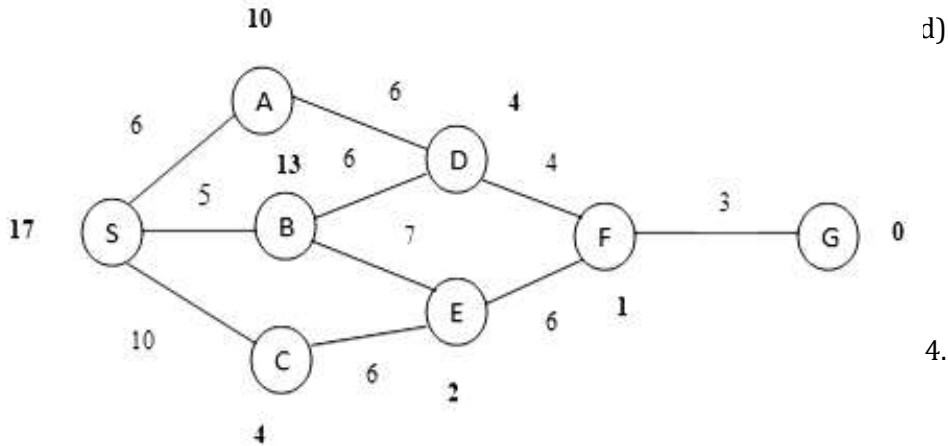   (a) You may get 8.5 SGPA in the semester
   (b) Be contented with what you are doing!
   (c) What an enchanting rainbow!!
   (d) 2 + 2 = 5.

(i) Epistemology is
   (a) study of nature of knowledge
   (b) knowledge about knowledge
   (c) hypothesis
   (d) none of these.

(ii) For a tree having highest depth d and branching factor b, the space complexity of depth first search is

(vii) Which of the following is tautology?
   (a) p ∨ q → p
   (b) p ∧ q → p
   (c) p → q
   (d) none of these.

(c) Lisp   (d) Honda Asimo.

Group – B

2. (a) What is the 'dominance' property among multiple heuristics? Explain in terms of 8-puzzle's problem.

   (b) Prove that A* is admissible.

   Perform A* algorithm for the following graph. Explicitly show the queue at each iteration. The bold face values represent the backward cost and the edge weights represent the edge cost in both ways.

   2 + (3 + 6) = 12

3. (a) How to define fitness function in a genetic algorithm? What is roulette wheel selection? Explain in terms of a binary coded chromosome.

   (b) How simulated annealing improves basic hill climbing search?

   (3 + 3) + 6 = 12

4.

Group – C

4. (a) Solve the following cryptarithmetic problem:
BASE + BALL = GAMES

(b) You are given two jugs, a 4-gallon one and a 3-gallon one, a pump which has unlimited water which you can use to fill the jug, and the ground on which water may be poured. Neither jug has any measuring markings on it. How can you get exactly 2 gallons of water in the 4-gallon jug? Write down the production rule and solve by forward chaining strategy.

4 + 8 = 12

5. (a) Show that the following pair of propositions are logically equivalent.
$p \rightarrow q$, $\neg q \rightarrow \neg p$

(b) Verify that the proposition $p \vee \neg(p \wedge q)$ is a tautology.

(c) Test the validity of the following argument:
If I study, then I will not fail mathematics.
If I do not play *Cricket*, then I will study.
But I failed mathematics.
Therefore I played *Cricket*.

3 + 3 + 6 = 12

Group – D

6. (a) Give predicate logic statements to describe the following:
(i) No one likes durian.
(ii) Children hate all those who hate animals.

(b) Consider the following knowledge base:
(i) All hounds howl at night.
(ii) Anyone who has any cats will not have any mice.
(iii) Light sleepers do not have anything which howls at night.
(iv) John has either a cat or a hound.
(v) (Conclusion) If John is a light sleeper, then John does not have any mice.
Prove by resolution theorem that the conclusion is derivable from the knowledge base.

4 + 8 = 12

7. Animals can be divided into various categories such as mammals and birds. Mammals have hair. They give milk too. Birds can fly and lay eggs. Animals who eat meat, are known as carnivore. These carnivore animals have pointed teeth, claws and forward eyes. Mammals who have hoofs or chew cud are known as ungulate. Cheetah is a mammal as well as a carnivore. It has tawny colour and dark spots. Giraffe is an ungulate. It has a long neck, long legs and dark spots. Zebra is also an ungulate with black stripes. Although a penguin is a bird, it cannot fly, but it can swim. It is coloured black and white.
Represent the above information using a semantic network.

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Group – E

8. (a) How does a 'Bayesian Network' work? Explain with a suitable example.

(b) When one has a cold, one usually has a high temperature (80% of the time). At any one time around 1 of every 10,000 people has a cold and that 1 in every 1,000 people has a high temperature. Now suppose you have a high temperature. What is the likelihood that you have a cold?

4 + 8 = 12

9. (a) Define plan-space search.

(b) Define the fuzzy modus ponens with an example.
Draw the pictorial definition for the linguistic variable TALL giving your own subjective values.

(c) Given the causal dependencies of events: A→B→C where A→B means A causes B to happen. Compute P(A,B,C) when P(C|B) = 0.8, P(B | A) = 0.4 and P(A) = 0.9.

2 + 4 + 6 = 12