ARTIFICIAL INTELLIGENCE
(CSBS 3135)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) A* follows the heuristic function given in
(a) f(n)=g*(n)+h(n) (b) f(n)=g*(n)+h*(n)
(c) f(n)=g(n)+h*(n) (d) f(n)=g(n)+h(n)

(ii) Local maximum plateau, Ridge are the difficulties in which searching algorithms?
(a) A* (b) Hill Climbing (c) Stimulated Annealing (d) AO*

(iii) If h_1 and h_2 are two admissible heuristic functions then which of the following may not be admissible?
(a) min(h_1,h_2) (b) max(h_1,h_2) (c) h_1*h (d) $h_1 + h_2$

(iv) Which of the search algorithm removes the branches that don't affect the final output?
(a) Alpha-Beta Pruning (b) Max-min
(c) Uniform Cost Search (d) A*

(v) Which algorithm is used in the Game tree to make decisions of Win/Lose?
(a) Heuristic Search Algorithm (b) DFS/BFS algorithm
(c) Greedy Search Algorithm (d) Max/Min algorithm.

(vi) The Skolem function used to remove
(a) α (b) β (c) ∀ (d) ∃

(vii) Which process makes two different logical expressions look identical?
(a) Unification (b) Substitution (c) Inference (d) Lifting.

(viii) The process of capturing the inference process as Single Inference Rule is known as
(a) Clauses (b) Ponens
(c) Variables (d) Generalized Modus Ponens

(ix) Fuzzy logic is a form of
(a) Binary set logic (b) Two-valued logic
(c) Multi-valued logic (d) Crisp set logic

(x) How the decision tree reaches its decision?
(a) Single test (b) Two test (c) Sequence of test (d) No test.

Fill in the blanks with the correct word

(xi) The performance of an agent can be improved by _____.

(xii) External actions of the agent is selected by _____.

(xiii) A _____ is a decision support tool that uses a tree-like graph or model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility.

(xiv) A technique that was developed to determine whether a machine could or could not demonstrate the artificial intelligence known as the _____.

(xv) The search algorithm which is similar to the minimax search, but removes the branches that don't affect the final output is known as _____.

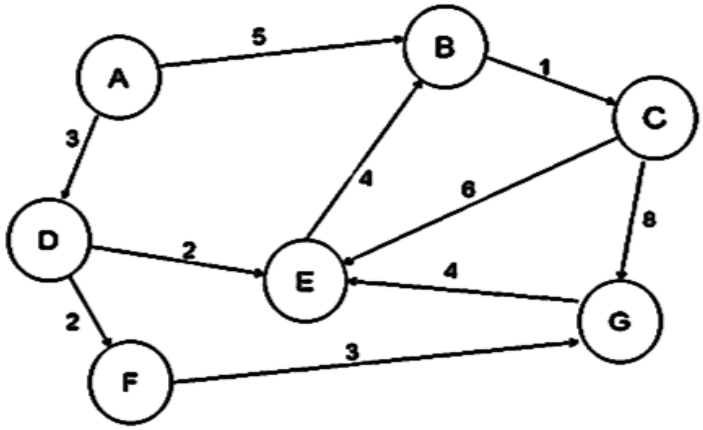
Group - B

2. (a) You are given two jugs, a 4-gallon one and a 3-gallon one. Neither have any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into the 4-gallon jug? Give the state space diagram. *[(CO1)(Analyze/IOCQ)]*

(b) Three missionary and three cannibals are standing in a left bank of a river. There is a boat having a capacity of taking two people and it can be driven by a missionary or cannibal. If the number of missionaries is less than the number of cannibals at any bank then cannibal will eat missionary. How is it possible for all the missionaries and cannibals to cross the river such that no missionary is getting eaten. Give state space diagram. *[(CO1)(Analyze/IOCQ)]*

6 + 6 = 12

3. (a) Apply uniform cost search for the following graph to find out the optimal path from source A to goal node G: *[(CO2)(Apply/IOCQ)]*

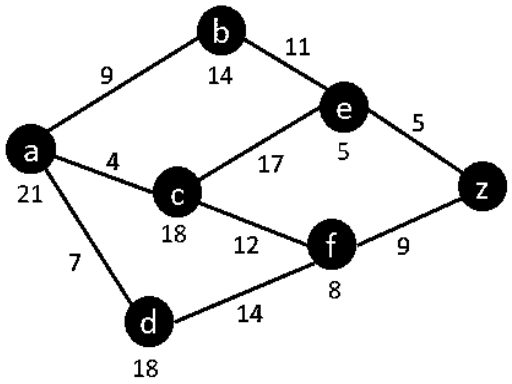


(b) Explain bidirectional search method. *[(CO2)(Understand/LOCQ)]*

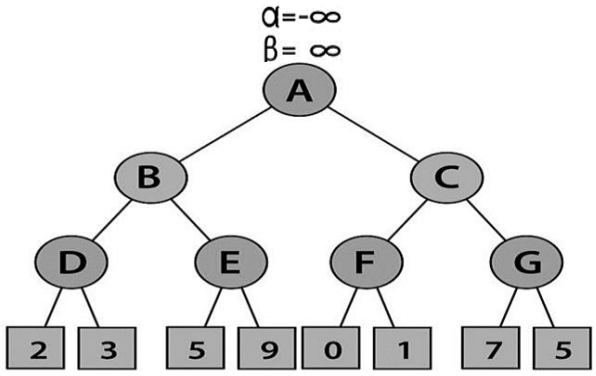
8 + 4 = 12

Group - C

4. (a) Apply A* algorithm to find out the shortest path from start node, a to goal node, z for the following graph. *[(CO2)(Apply/IOCQ)]*



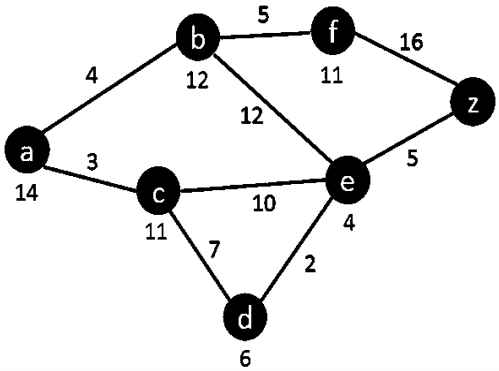
(b) Apply alpha beta pruning to find out the value at node A as given in following figure.



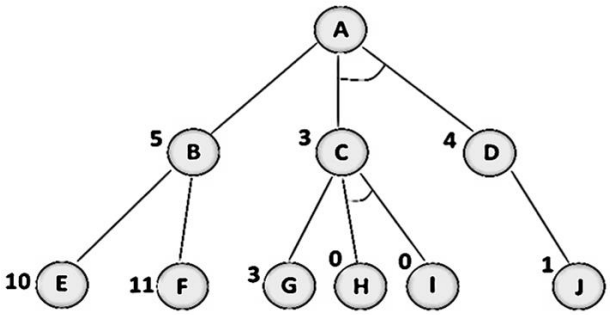
[(CO3)(Apply/IOCQ)]

6 + 6 = 12

5. (a) Apply A* algorithm to find out the shortest path from start node, a to goal node, z for the following graph. *[(CO2)(Apply/IOCQ)]*



(b) Apply AO* algorithm to find out the shortest path from start node, A to goal node, J for the following graph. *[(CO2)(Apply/IOCQ)]*



6 + 6 = 12

Group - D

6. (a) Consider the following Knowledge Base:
John likes all kind of food.
Apple and vegetable are food
Anything anyone eats and not killed is food.
Anil eats peanuts and still alive
Harry eats everything that Anil eats.
Goal: John likes peanuts.
Use predicate logic and apply resolution method to prove that the goal is derivable from the given knowledge base. *[(CO5)Apply/IOCQ)]*

(b) Show that the inverse and the converse of a conditional are logically equivalent. *[(CO4)(Apply/IOCQ)]*

(c) What are the limitation of propositional logic? *[(CO4)(Remember/LOCQ)]*

6 + 4 + 2 = 12

7. (a) Consider the following Knowledge Base:
The humidity is high or the sky is cloudy.
If the sky is cloudy, then it will rain.
If the humidity is high, then it is hot.
It is not hot.
Goal: It will rain. Use predicate logic and apply resolution method to prove that the goal is derivable from the given knowledge base. *[(CO5)(Apply/IOCQ)]*

(b) Write the predicate logic representations for the following sentences:
(i) Anil eats peanuts and still alive (ii) Harry eats everything that Anil eats
(iii) Every person in the party loves every child. *[(CO5)(Remember/LOCQ)]*

6 + 6 = 12

Group - E

8. (a) Differentiate between progression and regression planning. Write the components of Action schema in STRIPS. *[(CO6)(Analyze/IOCQ)]*

(b) Explain the following classification based algorithm: Support Vector Machine. *[(CO6)(Remember/LOCQ)]*

(c) How does decision tree help in decision making? *[(CO6)Analyze/IOCQ)]*

(3 + 3) + 3 + 3 = 12

9. (a) Classify different learning model. *[(CO6)(Understand/LOCQ)]*

(b) What is Gini index? *[(CO6)Remember/LOCQ)]*

(c) What is clustering? *[(CO6)Remember/LOCQ)]*

(d) Explain the basic architecture of a neural network with a diagram. *[(CO6)(Remember/LOCQ)]*

2 + 2 + 2 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	28.12	71.87	0