

2025

MCA 3rd Semester Examination

MCA

Paper : MCA - 302

(Artificial Intelligence)

Full Marks : 100

Time : Three Hours

*The figures in the margin indicate full marks.
Candidates are required to give their answers
in their own words as far as practicable.*

Group - A

Answer any five questions : $2 \times 5 = 10$

1. Differentiate between blind search technique and exhaustive search technique.
2. What do you mean by Existential quantifier? Give an example.
3. How do the completeness and optimality affect an algorithm?
4. What are the drawbacks of best first search?
5. Derive the truth table of $A + \bar{B} + C$.
6. What is the drawback of local beam search?

P.T.O.

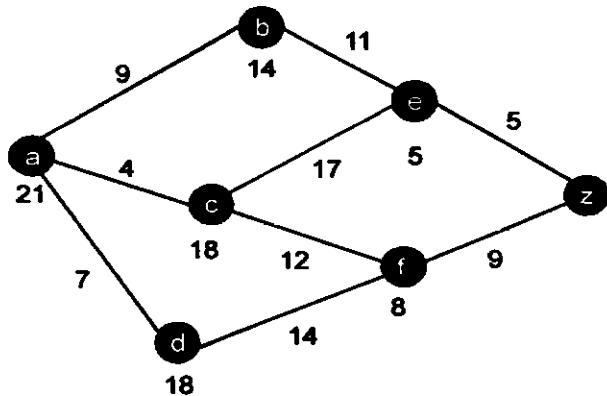
(2)

7. What are crossover rate and mutation rate?
8. Who coined the term "Artificial Intelligence"?

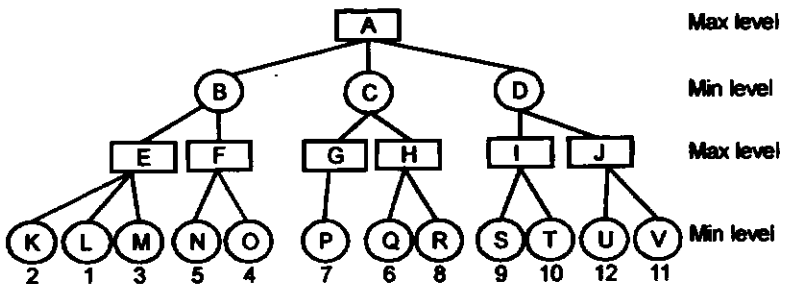
Group - B

Answer any *four* questions : $15 \times 4 = 60$

9. Apply A* on the following graph and show the sequence by which the nodes are get expanded. a is the initial node and z is the final goal node.



10. Apply alpha-beta pruning on the following game tree. Identify the alpha cutoff and beta cutoff.



11. (a) Critically compare Depth first search and breadth first search.
- (b) What is Roulette wheel selection? How does it work?
- (c) Explain test of intelligence. 5+5+5
12. What is heuristics? What is Manhattan distance heuristics? Is this heuristic admissible? Show proof against your answer. 2+3+2+8
13. In the missionaries and cannibals problem, three missionaries and three cannibals must cross a river using a boat which can carry at most two people, under the constraint that, for both banks, if there are missionaries present on the bank, they cannot be outnumbered by cannibals (if they were the cannibals would eat the missionaries). The boat cannot cross the river by itself without any people on board.
- (a) Formulate the problem as state space search problem.
- (b) Draw the state space search graph. (up to two level)
- (c) Solve the problem.
- (d) Apply Depth Limited search on the graph. Show each and every step. 4+4+3+4

P.T.O.

14. Translate the following English sentences into predicate logic : 3×5=15

- (a) Everyone loves everyone except himself.
- (b) Every student except George smiles.
- (c) Every student who loves Mary is happy.
- (d) Every boy who loves Mary hates every boy who Mary loves.
- (e) Someone walks and someone talks.

15. Write short notes on (any *five*) : 3×5=15

- (a) Bi directional search
- (b) Tabu Search
- (c) Uniform cost search
- (d) Crossover and Mutation
- (e) Propositional connectives
- (f) Iterative Deeping A*
- (g) Consistent heuristic

16. (a) For the game tree with root MAX, two MIN children, and leaf utilities : Left MIN has leaves 3, 12, 8; Right MIN has leaves 2, 4, 6; perform Minmax with Alpha-Beta pruning, showing the order of node visits and prunes.

(5)

- (b) Using a truth table, show that the formula
 $[(P \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (P \rightarrow r)$ is a tautology.

9+6

Internal Assessment : 30 marks
