Indian Institute of Engineering Science & Technology, Shibpur
B. Tech (8th Semester) Mid Semester Examination, February 2024
Subject: Entrepreneurship and Innovation Management
Paper Code: MS4262

Time: 2 hours   Full Marks: 30

Answer any five questions   [5 x 6 = 30]

Question 1   [3 + 3 = 6]

(i)   Why entrepreneurship should be taught to every engineering student?   5

(ii)   Distinguish between creativity and innovation. Give examples.   4

Question 2   [5 + 1 = 6]

(i)   What are the problems that the MSME sectors in India are presently facing? What are the strategies to promote the development of MSME in India?   7

(ii)   What do you mean by entrepreneurial management?   3

Question 3   [4 + 2 = 6]

(i)   How would you analyze the industry structure using competitive business strategy?   6

(ii)   What do you mean by 'Disruptive Innovation'? Give example.   4

Question 4   [3 x 2 = 6]

Comment on the statement given below:

(i)   Developing countries are a fertile ground for imitative rather than innovative entrepreneur.   6
(ii)   If you are an entrepreneur, then you will figure out what you want to do.   2
(iii)   Mukesh Ambani is the 20th century entrepreneur of India.   6

Question 5   [2 + 4 = 6]

(i)   Why market research is critical during product development? Explain.

(ii)   Briefly elucidate on the present entrepreneurial ecosystem in India.

Question 6   [3 + 3 = 6]

(i)   What are the objectives of the following schemes:

         (a) TIDE, (b) Start-up India, (c) MSME
(ii)   Name some leading higher educational institute-based business incubators in India. How higher educational institute -based business incubators can strengthen Indian entrepreneurial ecosystem?   4

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Indian Institute of Engineering Science and Technology, Shibpur

B. Tech·8ᵗʰ Semester Mid-Semester Examination,

February 2024

Artificial Intelligence (CS4201)

Full Marks: 30   Time: 2 Hours

Answer any three questions

All questions carry equal marks

1. (i) Define the relationship between agent and environment.
   (ii) Name different types of environments and briefly explain effects of each environment on agent.   2.5+(3+4.5)

2. (i) How many number of nodes are generated in a Depth-limited search and Iterative deepening search considering depth $d = 4$ and branching factor $b = 12$.
   (ii) What is the difference between Uniform cost search algorithm and Breadth First Search Algorithm?   (3+3)+4

3. (i) Define Evaluation function or Heuristic function to solve an informed search problem.
   (ii) Design the heuristic functions for the following 8-puzzle problem and show that the heuristic functions are admissible.   3+(3.5+3.5)

Start State   Goal State

4. (i) What are the drawbacks of Hill Climbing algorithm and how to overcome the situations?
   (ii) What are the differences between A* search algorithm and AO* search algorithm?   (3+3)+4

CST 8th Semester Midterm Examination, February 2024
Quantum Computing (CS-4226)
Full Marks 30   Time 120 minutes

Answer any four questions $(7\frac{1}{2} \times 4)$

OR

Answer any twelve out of the fifteen part questions $(2\frac{1}{2} \times 12)$

1. (a) Enlist properties of unitary operators that are useful for evolution of qubits in state space.
   (b) Explain the reversibility property of quantum logic gates.
   (c) How is the swap function realized using the controlled NOT gate?

2. The Pauli matrices are $X = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ $Y = \begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}$ $Z = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$
   (a) Find the adjoint of these matrices and explain the significance.
   (b) Derive a relation between the Pauli matrices X, Y, Z in terms of the commutator. For matrices A and B, $[AB - BA]$ represents commutator.
   (c) Explain the superdense coding in terms of these matrices.

3. (a) For classical information source, show that the information entropy maximizes when the symbols are equally likely.
   (b) Instead of the classical bits with probabilities $p, 1 - p$ respectively, a quantum system considers qubits that occur with probabilities $\frac{1+p}{2}, \frac{1-p}{2}$. How does the entropy change with respect to the classical case for $p = 0.5$ and $p = \frac{1}{3}$.
   (c) What is the long term probability of 0 and 1 for Markov source where $P(0|1) = p$ and $P(1|0) = q$?

4. Write short notes on:
   (a) Measurement or observation of qubits
   (b) Copying or cloning of qubits
   (c) Quantum teleportation

5. (a) Show that information entropy of the adjoint (equivalent zero memory source) of a Markov source approaches that of the Markov source for large extensions of the symbol space.
   (b) Define information channel and the entropies associated with it.
   (c) Derive the probability of error associated with a binary symmetric channel having distortion probability $p = 0.1$ for a repeating code that sends 00000 (five zeroes) for information bit 0 and 11111 (five ones) for information bit 1.

Indian Institute of Engineering Science and Technology, Shibpur

B. Tech 8th Semester End-Semester Examination,

April 2024

Artificial Intelligence (CS4201)

Full Marks: 50

Time: 3 Hours

Answer any three questions. Each question carry equal Marks

Two marks are allotted for precise answer

1. (i) Explain the role of discount factor in reinforcement learning, considering $\gamma = 0$, $\gamma = 1$ and γ varies from 0.2 to 0.8.

   (ii)　In a *grid world* **environment**, the goal of the *agent* is to reach state **I** starting from state **A** without visiting the *shaded states*. In each of the states, the agent can perform any of the four actions: *up, down, left, and right* to achieve the goal.
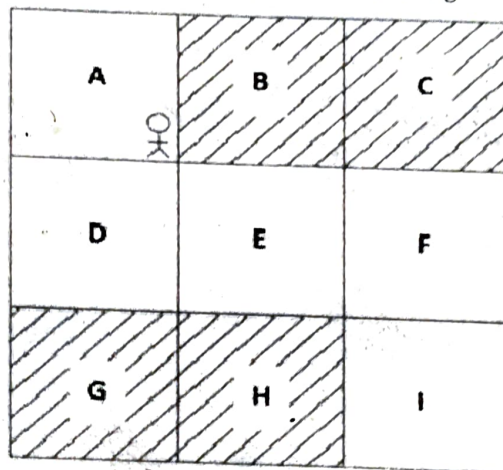
Explain what is the outcome of stochastic policy with help of the grid world environment, assuming given a state **A**, and suppose the stochastic policy returns the probability distribution over the action space as [0.10, 0.70, 0.10, 0.10].

   (iii)　How the Q-function differs from the value function of Reinforcement Learning?

   (iv)　Write the Bellman equation of calculating updated Q-function considering state S and Action A.

   4.5+5.5+3+3

2. (i) Initial and Final game trees are given below. Explain how the final game tree is achieved using appropriate algorithm.

Initial

Final
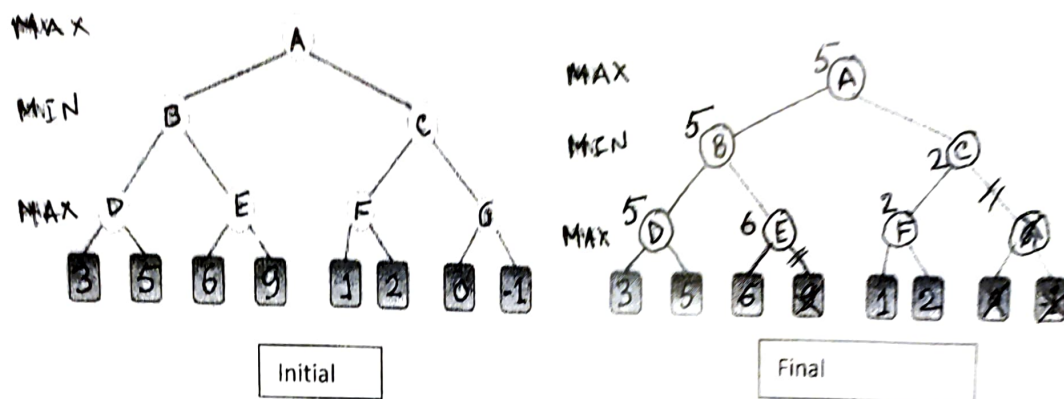
(ii) Write the properties of MINIMAX Game search algorithm.

(iii) When do you apply α-β pruning in MINIMAX Tree?

8+4+4

3. (i) Describe the key differences between a Mamdani FIS Model and a Takagi-Sugeno-Kang FIS Model.

(ii) Air pollution studies have shown that the air quality is very poor during peak traffic hours in Kolkata. Two expert Pulmonologists on the basis of their several years of experience, categorized the respiratory diseases into three groups: (i) Bronchitis (B), (ii) Asthma (A), (iii) COPD (C).

Basic probability assignment (m) of two experts is given below.

Disease	A	B	C	A∪B	A∪C	B∪C	A∪B∪C
Expert1 (m1)	0.10	0..20	0.40	0.06	0.07	0.08	0.09
Expert2 (m2)	0.20	0.30	0.25	0.06	0.06	0.07	0.06

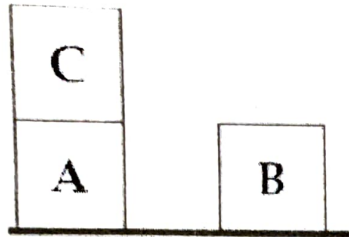Determine the joint basic probability assignment (m12) using Dempster-Shafer's rule of combination.

(iii) What is the purpose of Belief Network?
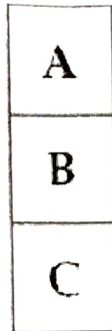
(iv) What is the need of Probabilistic reasoning in AI?

3+7+ 3+3

4. (i) What do you mean by Sussman anomaly? Explain it using the following example.

Initial State: **Goal:**

Initial State: (on-table A)(on C A) (on-table B)
              (clear B) (clear C)   Goal: (on A B) (on B C)

(ii)   What is Markov decision process?
(iii)   Write Q-learning algorithm   (3+5) + 3+5

5. (i) What are the differences between Games and Search Problems in AI?

    (ii) Suppose Fuzzy relation R1 and R2 are defined on X×Y, Y×Z, respectively. X, Y and Z are
    universe of discourse such that $x \in X$, $y \in Y$, $z \in Z$. Find out the fuzzy relation R3 on X×Z.

    (iii) If you know that coin is fair with 90% certainty then what is the value of BELIEF (Head) and
    BELIEFE (~Head)?

    (iv)   Explain Exploration VS Exploitation dilemma.   3+5+4+4

Indian Institute of Engineering Science and Technology, Shibpur

B. Tech Final Year (8th Semester) Examination, 2024

Entrepreneurship and Innovation Management (MS4262)

Full Marks: 50   Time: 3 hours

Attempt any 5 questions:

Q1: ABC company Limited proposes to start a new venture for the manufacture of fluorescent bulbs. The estimates of the new venture are as under:

Output of bulbs per annum	3,00,000 nos
Expected sales revenue per annum	INR. 1,50,00,000
Fixed costs	INR 35,00,000
Variable costs	INR 66,00,000

(i)   If the selling price comes down to Rs. 40.00 per unit, find out its effect on BEP.
(ii)   If the fixed cost increases to Rs. 40,00,000, find out its effect on BEP.
(iii)   If the variable cost increases by 10%, find out its effect on BEP.

(BEP = Break-even point).

Q2: Answer the following questions in brief:

(i)   What is elevator pitch?
(ii)   Distinguish between innovation and creativity.
(iii)   What is the difference between managerial orientation and entrepreneurial orientation?
(iv)   What is frugal innovation?
(v)   What is marketing mix?
(vi)   What is the role of business model?
(vii)   Distinguish between intrapreneur and entrepreneur.
(viii)   What is the importance of start-up India scheme?
(ix)   Do you consider Uber- a disruptive innovation? Why or why not?
(x)   What is green marketing? Give example.

Q3: Answer the following questions:

(i)   Think of an innovative idea and represent it in form of business model.
(ii)   Explain each component of the proposed business model for your idea.

Q4: What is a B-Plan? For what purpose it is used? Elucidate all the components of a B-plan in detail.

Q5: Briefly elucidate on life cycle of venture development process. Which stage of the process is most critical?

Q6: Explain the functional tradeoffs for the following with respect to cost:

   (i)   Warehouse - inventory

   (ii)   Warehouse - transportation

   (iii)   Warehouse - service

Q7: An entrepreneur at XYZ manufacturing company is trying to decide whether to produce at a level production rate or a chase sales production rate. In his analysis of the company operations, he has collected the following information:

Beginning employment level	10 employees
Beginning inventory	0 unit
Hiring cost	INR 10 per employee
Firing cost	INR 5 per employee
Production per employee	10 units per quarter
Holding cost	INR 1 per unit per quarter

Target inventory at the end of the quarter is zero units. Target employment level at the end of the fourth quarter equals the planned employment level specified by the plan under consideration. The estimated demand for each quarter provided by the sales team is given below:

Quarter	Sales Forecast
1	50 units
2	80 units
3	120 units
4	150 units

Which of the two strategies would result in lowest production cost? Show your calculation for each strategy separately.

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CST 8th Semester Final Examination, April-May 2024
Quantum Computing (CS-4226)
Full Marks 50

Time 3 hours

Answer any four questions $((6+6) \times 4)$

OR

Answer any eight out of the twelve part questions (6×8)

Two marks are reserved for neatness.

1. (a) Describe the physical conditions necessary for quantum computation.
   (b) Discuss about any one technology of quantum computer realization and explain how it fulfils the above conditions.

2. (a) Show mathematically that if message rate exceeds channel capacity, reliable communication is not possible over classical channel.
   (b) Discuss about a coding scheme that ensures correction of both bit flip as well as phase flip error in quantum communication.

3. (a) Show that the quantum Fourier transform (QFT) resembles unitary transform and provides drastic complexity improvement over the classical fast Fourier transform.
   (b) Describe an algorithm that utilizes QFT and number theory to perform factorization of a number into its two prime factors and give an illustrative example.

4. Give schematic circuit with brief relevant explanation and complexity analysis for the following:
   (a) Quantum search algorithm based on Grover iterations
   (b) 3-qubit Quantum Fourier transform

5. (a) Discuss in detail about any two properties that make quantum computing unique.
   (b) Is it possible to perform classical computation on quantum computer? - Explain schematically and with proper illustration.

6. Write short notes on:
   (a) Software development facility for quantum algorithm implementation
   (b) Quantum key distribution in cryptography