

- 1 Define opcode. Describe the fetch-execute cycle of a microprocessor with an example. 03
- 2 Suppose, AX contains 5ABCh and BX contains 21FCCh. Find the difference of AX and BX by using complementation and addition operation. 03
- 3 What are data registers? Write down the special features of 80286 μ P over 8086 μ P. 03
- 4 What is memory segment? Translate the following high level code into equivalent assembly code. $A = B - 2 \times A$ 03
- 5 What is flag register? How does flag affect a MOV operation? Show, how the instruction ADD AL,BL affect on flags? where AL contains 80h, BL contains 80h. 03

must be consistent for optimal solution in A* search algorithm.

3. Define agent. Describe how agents interact with environments through sensors and actuators. What are softbots? Write down the PEAS description of the task environment for an automated taxi. 3
4. Illustrate the schematic diagram of a simple reflex agent. Explain how the algorithm works according to a rule whose condition matches the current state and is activated by it. 3

representing constraint graph.
Formulate a tree-structured CSP. How can we solve it using backtracking search based on tree decomposition. 3

- (b) What is Bayes' rule? Compute the probability that a patient has a disease given that he is an alcoholic. "Being an alcoholic" is the hypothesis and "Having the disease" is the evidence. Data tells you that 10% of patients have the disease and 70% of patients are alcoholics. You might also know that 7% of patients with the disease are alcoholics, 7% are alcoholics. 3

- (c) Define conditional independence. Illustrate with the dentistry example. 3

4. (a) Define decision tree. Draw a decision tree for the following data set. 3

set for building decision algorithm on the restaurant 3+3=6

loss using gradient descent for

neural network. Demonstrate a simple back-propagation algorithm for learning in a 5

- (a) intelligence, (b) artificial intelligence, (c) agent, (d) 3

classes of problems that are intractably difficult for computers, are provably undecidable. Does this mean that AI is impossible? 4

15 35
55 225 979

use Newton-Raphson method to estimate the root of $f(x) = e^x - x$, employing an initial guess of $x_0 = 0$. Iterate until ϵ less than 10^{-8} %. 7

Patuakhali Science and Technology University

Department of Computer Science and Information Technology

5th Semester (Level-3, Semester-I), Midterm Examination of B.Sc. Engg.(CSE), July-Decem./2022

Session: 2012-21

Course Code: CTT-315 Course Title: Artificial Intelligence

Full Marks: 15 Duration: 1 hour

1. Write the steps in problem solving. Mention the four ways to evaluate an algorithm's performance. Compare the uninformed search strategies in terms of the evaluation criteria. 05
2. What is a heuristic function? Let, you have a graph with heuristic values, show the heuristic must be consistent for optimal solution in A* search algorithm. 03
3. Define agent. Describe how agents interact with environments through sensors and actuators. 04
What are agents? Write down the PLEAS description of the task environment for an automated taxi.
4. Illustrate the schematic diagram of a simple reflex agent. Write down the algorithm, how acts according to a rule whose condition matches the current state, as defined by the percept. 03



Patuakhali Science and Technology University

Sc. Engg. (CSE) 5th Semester (Level-3, Semester-I) Final Examination January-June 2023

Course code: CIT-315

Course Title: Artificial Intelligence

Year: 2020-21

Credit hour: 3.00

Full marks: 70

Duration: 3 hours

[figures in the right margin indicate full marks. Split answering of any question is not recommended]

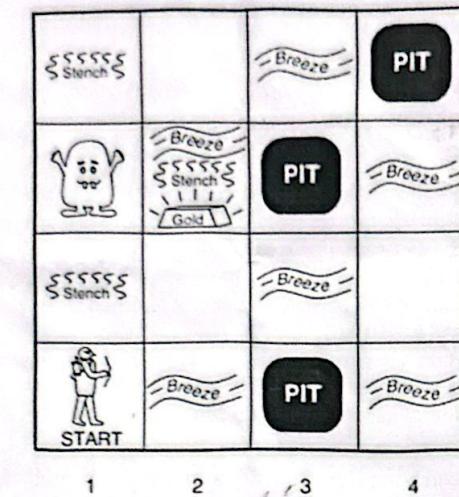
Answer any 5 of the following questions.

- ✓ 1. (a) What is a problem-solving agent? Write the steps of problem solving. Given an example of a typical instance with an 8-puzzle problem, including the start state and goal state. 3
 (b) How does an algorithm's performance evaluate? List the four ways for evaluating the performance of the algorithm. Explain the iterative deepening depth-first search, IDS, algorithm with its performance evaluation. Compare the IDS and BFS algorithms for generating the total number of nodes if $b = 10$ and $d = 5$. 6
 (c) What is the heuristic function of informed search strategy? How to minimize the total estimated solution cost using the best-first search, A* search, algorithm. Show the heuristic must be consistent for optimal solution in A* search algorithm. 5
- ✗ 2. (a) Why do we use local search strategy to address optimization problem? What are the key advantages of local search algorithms? Demonstrate a one-dimensional state-space landscape in which elevation corresponds to the objective function. 5
 (b) What are the reasons, problems, of the hill-climbing algorithm for getting stuck? How to escape these problems using many variants of hill-climbing algorithm? 2+2=4
 (c) Write the limitation of the local beam search. Illustrate the genetic algorithm for digit strings representation of 8-queen states. 1+4=5
3. (a) Define constraint satisfaction problem, CSP. Formulate a map coloring problem of states and territories of Australia, which can be viewed as a CSP problem. The goal is to assign colors to each region so that no neighboring regions have the same color. The map-coloring problem represented as a constraint graph. Formulate a tree-structured CSP. How to solve the tree-structured CSP using the approach based on tree decomposition. 3+3=6
 (b) What is Bayes' rule? Compute the patient's probability of having the liver disease if they are an alcoholic. "Being an alcoholic" is the test (kind of like a litmus test) for liver disease. Past data tells you that 10% of patients entering your clinic have liver disease and 5% of the clinic's patients are alcoholics. You might also know that among those patients diagnosed with liver disease, 7% are alcoholics. 3
 (c) Define conditional independence. Derive a naïve Bayes model, Bayesian classifier, based on the dentistry example. 2+3=5
4. (a) Define the following terminologies in your own words: Supervised learning, K-fold cross validation, and Empirical loss. 3
 (b) How to compute entropy and information gain from attributes in a dataset for building decision tree as a classifier? Illustrate the learning curve for the decision tree algorithm on the restaurant dataset.
What is a univariate linear regression? How to minimize the loss using gradient descent for fitting linear regression? 3+3=6
 (c) Briefly mention the major applications of artificial neural network. Demonstrate a simple mathematical model for a neuron. State the back-propagation algorithm for learning in a multilayer network. 5
5. (a) What is AI? Define in your own words: (a) intelligence, (b) artificial intelligence, (c) agent, (d) rationality, (e) logical reasoning. 3
 (b) i. There are well-known classes of problems that are intractably difficult for computers, and other classes that are provably undecidable. Does this mean that AI is impossible? 4

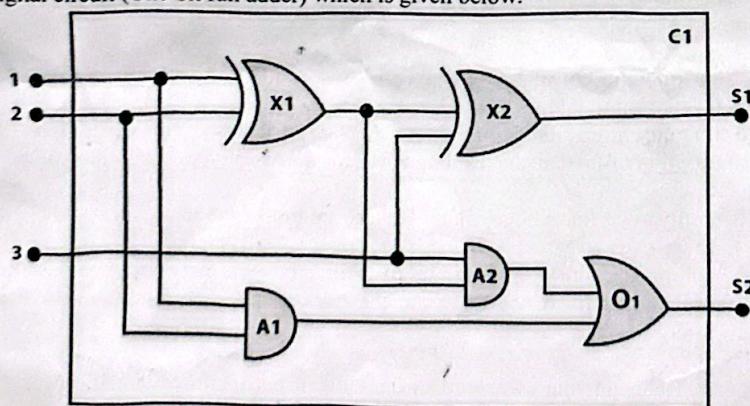
15	55	225
55	225	979

- (B) Use the Newton-Raphson method to estimate the root of $f(x) = e^{-x} - x$, employing an initial guess of $x_0 = 0$. Iterate until ϵ less than $10^{-8}\%$. 7

- ii. "Surely computers cannot be intelligent—they can do only what their programme tell them." Is the latter statement true, and does it imply the former?
 What is propositional logic? Drives a propositional logic from Wumpus world is a cave consisting of rooms connected by passageways. Prove that Wumpus is in (1,3) position.



- (d) Describe the following inference rules for propositional logic. 2
- i. Modus Ponens
 - ii. Hypothetical Syllogism
6. (a) Define autonomy. Write an essay on the relationship between evolution and one or more of autonomy, intelligence, and learning. 2
- (b) How do the components of agent programs work? Write pseudocode agent programs for the goal-based and utility-based agents. 2
- (c) Define quantifier. Describe about universal and existential quantifiers with example. 2
- (d) Translate the following sentences into first order logic. 3
- i. Some boys play cricket.
 - ii. Not all students like both Mathematics and Science.
 - iii. Only one student failed in Mathematics.
 - iv. Every man respects his parent.
 - v. All birds fly.
 - vi. Someone is liked by everyone
- (e) What is knowledge-engineering? Develop a knowledge base which will allow us to reason about digital circuit (One-bit full adder) which is given below. 5



Dept. of Computer and Communication Engineering
 Faculty of Computer Science and Engineering
 Patuakhali Science and Technology University
 Dumki, Patuakhali-8602, Bangladesh

Final Examination of B. Sc. Engineering in CSE Level: 3 Semester: I Session: 2020-2021

Course Code
CCE-311

Course Title
Numerical Methods

January-June-2023

Credit: 03
Time: 03 Hr
Marks: 70

Answer any 05 out of 06 Questions (Split answers are highly discouraged)

1. A In a market survey three commodities A, B and C were considered. In finding out the index number some fixed weights were assigned to the three varieties in each of the commodities. The table below provides the information regarding the consumption of three commodities according to the three varieties and also the total weight received by the commodity. Use Cramer's Rule to find the weights assigned to the three varieties. 7

Commodity Variety	Variety			Total Weight
	I	II	III	
A	1	2	3	11
B	2	4	5	21
C	3	5	6	27

- B A total of 50000 Taka was invested in two accounts. One account earned 4 (3/4) % annual interest and the other earned 6 (1/2) % annual interest. If the total interest for one year was 8500.50 taka. The task is to determine how much money was invested in each account using the Gauss-elimination method. 7

2. A Given $dy/dx = 1+x^2y$ and $y(0)=1$. Calculate $y(0.1)$, $y(0.2)$ using Picard's method. 7
 B Given $dy/dx = \frac{1}{2}(x+y)$, $y(0)=1.5$, $y(0.5)=1.636$, $y(1.0)=2.595$, $y(1.5)=3.968$. Find $y(2)$ by Milne's method. 7

3. A Use bisection method to solve the following problem up to approximate percent relative error $\epsilon_a \leq 0.422$. 7

$$f(c) = \frac{667.38}{c} (1 - e^{-0.146843c}) - 40$$

- B Use the Gauss-Jordan technique to solve the system. 7

$$\begin{aligned} 0.3x_1 - 0.1x_2 - 0.2x_3 &= 7.85 \\ 0.1x_1 + 7x_2 - 0.3x_3 &= -19.3 \\ 0.3x_1 - 0.2x_2 + 10x_3 &= 71.4 \end{aligned}$$

4. A Implement the point-slope strategy to numerically integrate $dy/dx = -2X^3 + 12X^2 - 20X + 8.5$ from $X=0$ to $X=4.0$ with a step size 1.0. The initial condition at $X=0$ is $Y=1$. 7

- B Demonstrate the concepts of convergence and divergence through an appropriate example using the iteration method. 7

5. A Use the secant method to estimate the root of $f(x) = e^{-x} - x$. Start with initial estimates of $x_1 = 0$ and $x_0 = 1.0$. The true root is 0.56714329. Iterate until $\epsilon_t = 0.0048\%$. 7

- B Fit a second-order polynomial to the data of the following table. Also find out standard error S_{yx} 7

x_i	y_i
1	7.7
2	13.6
3	27.2

6. A Apply Cholesky decomposition to the following symmetric matrix. 7

$$[A] = \begin{bmatrix} 6 & 15 & 55 \\ 15 & 55 & 225 \\ 55 & 225 & 979 \end{bmatrix}$$

- B Use the Newton-Raphson method to estimate the root of $f(x) = e^{-x} - x$, employing an initial guess of $x_0 = 0$. Iterate until ϵ_t less than $10^{-8}\%$. 7

[Figure in the right margin indicates full marks. Split answering of any question is not recommended.]
 Answer any 5 of the following questions.

- a) Define Computer Organization and Computer Architecture. What is the difference between them? 2
- b) What are the key concepts of Von Neumann architecture? Define hardware and software programming. 5
- c) Define Interrupts. What are the approaches for handling multiple interrupts? Illustrate and explain. 5
- d) What are the steps of the instruction cycle for the instruction "SUB B, A," which stores the difference of memory locations B and A into location A? 2
- 2 a) Define computer instructions and describe their types. 3
- ① b) Where Zero-address instructions are applicable and how? Explain. 2
- c) What are logical, arithmetic, and cyclic (rotate) shifts? Apply a 4-bit logical right shift, logical left shift, arithmetic right shift, arithmetic left shift, right rotate, and left rotate to the bits 10100110. 5
- d) What is a procedure, and why is it necessary? Illustrate and explain the procedure mechanism. 4
- 3 a) What is an I/O module, and why is it necessary? 3
- b) What are the differences among Programmed I/O, Interrupt-driven I/O and direct memory access (DMA)? Describe with flowcharts. 5
- c) How does a DMA module transfer control to the processor after its task? Does it interrupt the processor? Define *cycle stealing* in DMA. 2
- d) Give the features of CISC and Corei7 in the perspective of computer architecture and organization . 4
- 4 a) A hypothetical machine has 6 instructions 5
- | | |
|----------------------------|-------------------------|
| 1110=Load AC from memory | 1011=Sub memory from AC |
| 0001=Store AC to memory | 0110=Store AC to I/O |
| 0101=Add to AC from memory | 1101=Load AC from I/O |
- In this case, the 12-bit address identifies a particular I/O device. Show the program execution steps (using 16 bit instruction format where prefix 4 bits for opcode) for the following program.
- Load AC from device 99.
 - Add contents of memory location 555
- Store AC to memory location 666.
- b) Explain RAID 2. Mention the characteristics of semiconductor memories (4 types). 2+2
- c) i. Enlist different addressing mode. 2+3
- ii. Assume numbers are represented in 6-bit two's complemented representation. Show calculation of the following.
- $-A+B$ (Hex)
 - 33-17 (Decimal)
- 5 a) Consider a machine with a byte addressable main memory of 2^{16} bytes and block size of 8 bytes. Assume that a direct mapped cache consisting of 32 lines is used with this machine.
- How is a 16-bit memory address divided into tag, line number, and byte number?
 - Into what line would bytes with each of the following addresses be stored?
 $0001\ 0001\ 0001\ 1011$
 $1101\ 0000\ 0001\ 1101$
 - Suppose the byte with address 0001 1010 0001 1010 is stored in the cache. What are the addresses of the other bytes stored along with it?
 - How many total bytes of memory can be stored in the cache?
- b) Calculate the multiplication operation using Booth's algorithm for $Q = -17$ (multiplicand) and $M = 16$ (multiplier). 4
- c) i. Define access time and cycle time.
 ii. Distinguish among sequential, direct and random memory access. 2+3

Given the network graph, find the shortest path from x to all network nodes. Show how the algorithm works and draw also the shortest path graph.

Explain the three segments during the connection establishment using an initial sequence number (ISN) of 14,534. The other party opens the connection with an ISN of 21,732. 5

- 6 a) i. Explain the responsibility of memory management unit in computer system.
ii. Assume a pipeline with 4 stages: fetch instruction (FI), decode instruction and calculate address (DA), fetch operand (FO), and execute (EX). Draw a timing diagram for instruction pipeline operation for a sequence of 9 instructions, in which the fifth instruction is a branch that is taken and in which there is no data dependencies.
- b) Describe the structure of SRAM. Give the features of SRAM and DRAM. 2+2
- c) Define virtual address and physical address space. Explain page miss mechanism in virtual memory system. 2+3

2

2+2

2+3

Dept. of Computer and Communication Engineering

Faculty of Computer Science and Engineering

Patuakhali Science and Technology University

Dumki, Patuakhali-8602, Bangladesh

Final Examination of B. Sc. Engineering in CSE Level: 3 Semester: I Session: 2020-2021

Course Code	Course Title	January-June 2023	Credit: 03
CCE 313	Computer Network		Time: 03 Hr Marks: 70

Answer any 05 out of 06 Questions (Split answers are highly discouraged)

- 1 [A.] What distinguishes a host from an end system? Provide examples of various end systems. Would a web server be considered an end system? How are end systems related to hosts, and what distinguishes clients from servers within this context? 3
- [B.] HFC, DSL, and FTTH are all used for residential access. For each of these access technologies, provide a range of transmission rates and comment on whether the transmission rate is shared or dedicated. 2
- [C.] Suppose users share a 2 Mbps link. Also suppose each user transmits continuously at 1 Mbps when transmitting, but each user transmits only 20 percent of the time. 4
- When circuit switching is used, how many users can be supported?
 - For the remainder of this problem, suppose packet switching is used. Why will there be essentially no queuing delay before the link if two or fewer users transmit at the same time? Why will there be a queuing delay if three users transmit at the same time?
 - Find the probability that a given user is transmitting.
 - Suppose now there are three users. Find the probability that at any given time, all three users are transmitting simultaneously. Find the fraction of time during which the queue grows.
- [D.] In this scenario, we are considering the transmission of real-time voice from Host A to Host B over a packet-switched network using VoIP. Host A converts the analog voice signal into a digital bit stream at a rate of 64 kbps. Host A then collects the bits into packets, each containing 56 bytes. There is a single link between Hosts A and B with a transmission rate of 10 Mbps and a propagation delay of 10 milliseconds. As soon as Host A forms a packet, it immediately sends it to Host B. Upon receiving the entire packet, Host B converts the packet's bits back into an analog signal. What is the total time that elapses from the moment a bit is created (from the original analog signal at Host A) until it is decoded (as part of the analog signal at Host B)? 3
- [E.] What are an application-layer message, a transport-layer segment, a network-layer datagram, and a link-layer frame? 2
- ✓ [A.] A router receives a packet with the destination address 201.24.67.32. Show how the router finds the network address of the packet. 2
- [B.] What is CIDR, and how can you extract block information from a given IP address? 3
- [C.] Assume a company has three offices: Central, East, and West. The Central office is connected to the East and West offices via private, point-to-point WAN lines. The company is granted a block of 64 addresses with the beginning address 70.12.100.128/26. The management has decided to allocate 32 addresses for the Central office and divides the rest of addresses between the two other offices. Finally the block with its ip address 4
- [D.] An ISP is granted a block of addresses starting with 150.80.0.0/16. The ISP wants to distribute these blocks to 2600 customers as follows: 5
- The first group has 200 medium-size businesses; each needs approximately 128 addresses.
 - The second group has 400 small businesses; each needs approximately 16 addresses.
 - The third group has 2000 households; each needs 4 addresses.
- remaining 2000 + block diagram .
- 3 [A.] In classless addressing, we know the first and the last address in the block. Can we find the prefix length? If the answer is yes, show the process and give an example. 3
- [B.] We noted that network layer functionality can be broadly divided into data plane functionality and control plane functionality. What are the main functions of the data plane? Of the control plane? 3
- [C.] Compare and contrast the properties of a centralized and a distributed routing algorithm. Give an example of a routing protocol that takes a centralized and a decentralized approach. 3
- [D.] Consider the following network. With the indicated link costs, use Dijkstra's shortest-path algorithm to compute the shortest path from x to all network nodes. Show how the algorithm works by computing a table and draw also the shortest path graph. 5
- 4 [A.] TCP opens a connection using an initial sequence number (ISN) of 14,534. The other party opens the connection with an ISN of 21,732. i. Show the three TCP segments during the connection establishment. 5

- ii. Show the contents of the segments during the data transmission if the initiator sends a segment containing the message "Hello dear customer" and the other party answers with a segment containing "Hi there seller." 5
 iii. Show the contents of the segments during the connection termination. 4
- [B.]** Show the entries for the header and pseudoheader of a UDP user datagram that carries a message from a Daytime client (153.18.8.105) to a Daytime server (171.2.14.10). Consider the data message "TESTING". Choose the correct well-known port number and 1087 as ephemeral port number. Calculate the checksum value. Show the UDP packet ready to be sent. 4
- [C.]** In a send window, $S_f = 401$ and $S_n = 701$. If window size is 1,000 bytes, show the send window before and after the station receives an ACK segment with $ackNo = 601$ and $rwnd = 700$. Ignore congestion control. Does this situation mean shrinking the window? 3
- [D.]** Illustrate the "half-close" case in TCP. 2
- 5** **[A.]** A DNS client is looking for the name of the computer with IP address 132.1.17.8. Show the query message. Also show the response message sent by the server to this query. Encapsulate the query and response message in a UDP user datagram 5
✓ **[B.]** Consider distributing a file of $F = 20$ Gbits to N peers. The server has an upload rate of $us = 30$ Mbps, and each peer has a download rate of $di = 2$ Mbps and an upload rate of u . For $N = 10, 100$, and 1,000 and $u = 300$ Kbps, 700 Kbps, and 2 Mbps, prepare a chart giving the minimum distribution time for each of the combinations of N and u for both client-server distribution and P2P distribution. 4
✓ **[C.]** How does SMTP mark the end of a message body? How about HTTP? Can HTTP use the same method as SMTP to mark the end of a message body? Explain. 3
✓ **[D.]** What is the function of MIME? A sender sends a JPEG message. Show the MIME header. 2
- 6** **[A.]** Obtain the HTTP/1.1 specification (RFC 2616). Answer the following questions: 5
 - i. Explain the mechanism used for signaling between the client and server to indicate that a persistent connection is being closed. Can the client, the server, or both signal the close of a connection?
 - ii. What encryption services are provided by HTTP?
 - iii. Can a client open three or more simultaneous connections with a given server?
 - iv. Either a server or a client may close a transport connection between them if either one detects the connection has been idle for some time. Is it possible that one side starts closing a connection while the other side is transmitting data via this connection? Explain.
- [B.]** Why do we need an RRQ or WRQ message in TFTP but not in FTP? Show the encapsulation of an RRQ message and a WRQ message in separate UDP user datagram. Assume the file name is "Report" and the mode is ASCII. What are the size of UDP datagrams? 4
- [C.]** Consider a DASH system for which there are N video versions (at N different rates and qualities) and N audio versions (at N different rates and qualities). Suppose we want to allow the player to choose at any time any of the N video versions and any of the N audio versions.
 - i. If we create files so that the audio is mixed in with the video, so server sends only one media stream at given time, how many files will the server need to store (each a different URL)?
 - ii. If the server instead sends the audio and video streams separately and has the client synchronize the streams, how many files will the server need to store?3
- [D.]** What is the Apache Web server? How much does it cost? What functionality does it currently have? 2

Chapter
24
TCP
and
HTTP

Patuakhali Science and Technology University
Department of Computer Science and Information Technology
5th Semester (Level-3, Semester-I), Midterm Examination of B.Sc. Engg.(CSE), July-Decem./2022
Session: 2012-21
Course Code: CIT-315 Course Title: Artificial Intelligence
Full Marks: 15 Duration: 1 hour

1. Write the steps in problem solving. Mention the four ways to evaluate an algorithm's performance. Compare the uninformed search strategies in terms of the evaluation criteria. 05
2. What is a heuristic function? Let, you have a graph with heuristic values, show the heuristic must be consistent for optimal solution in A* search algorithm. 03
3. Define agent. Describe how agents interact with environments through sensors and actuators. 04
What are softbots? Write down the PEAS description of the task environment for an automated taxi.
4. Illustrate the schematic diagram of a simple reflex agent. Write down the algorithm, how acts according to a rule whose condition matches the current state, as defined by the percept. 03

- Formulate a tree-structured CSP. Explain how to solve a problem using a tree-structured CSP using the approach based on tree decomposition.
- (b) What is Bayes' rule? Calculate the probability of having a liver disease if they are an alcoholic. "Being an alcoholic is a symptom of having a liver disease." Assume that 10% of the clinic's patients have a liver disease and 5% of the clinic's patients are alcoholics. Among the patients diagnosed with liver disease, 7% are alcoholics. 3
- (c) Define conditional probability. Explain how to build a Bayesian classifier, based on the dentistry 2+3=5
4. (a) Define the validation. Explain the validation process in supervised learning, K-fold cross 3
- (b) How to construct a decision tree as a classifier? Explain the steps in a dataset for building decision tree as a classifier. 3+3=6
What is gradient descent? Explain the steps in a dataset for building decision tree as a classifier. 3
- (c) Explain the backpropagation algorithm for learning in a neural network. Demonstrate a simple backpropagation algorithm for learning in a neural network. 5
5. (a) What is AI? Explain the following terms: (a) machine intelligence, (b) artificial intelligence, (c) agent, (d) knowledge representation. 3
- (b) Explain why it is difficult to program computers to do what humans can do easily. Is it really difficult for computers, to learn? Explain. 4
What does it mean that AI is impossible?

5. 79) Find the root of $f(x) = e^x - x$, employing an initial