Dept. of Computer and Communication Engineering

Patuakhali Science and Technology University

Course Code: CCE 311 Course Name: Numerical Methods

1. A Use the Gauss-Jordan technique to solve the system.

$3x_1 - 0.1x_2 - 0.2x_3 = 7.85$

$0.1x_1 - 7x_2 - 0.3x_3 = -19.3$

$0.3x_1 - 0.2x_2 - 10x_3 = 71.4$

B i. Drive the formula of false position method with proper figure.

ii. Differentiate between Gauss-Jordan and Gauss elimination method.

Dept. of Computer and Communication Engineering

Patuakhali Science and Technology University

5th Semester (Level-3, Semester-I), Mid Examination of B.Sc. Engg. (CSE), January-June: 2022

Course Code: CCE-313 Course Title: Computer Networks

Credit Hour: 3.0 Full Marks: 15 Time : 60 minutes

01. Find the netid, subnet mask and the hostid of the following IP addresses:
a. 114.34.2.8 b. 132.56.8.6 c. 208.34.54.12 d. 251.34.98.5
02. An address in a block is given as 191.8.243.9. Find the number of addresses in the block, subnet mask the first address, and the last address.
03. A company is granted the site address 201.70.64.0. The company needs six subnets. Design the subnets and shows the first address and last address with subnetmask through a pictorial representation.
04. What are the services that a transport-layer protocol cannot provide to applications invoking it?
05. How can an application use the services of TLS?
06. Describe how installing a proxy server can reduce the delay in receiving a requested object.

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)**, January-June/2022.

Session: 2019-20

Course Code: CTE-311 Course Title: Microprocessor and Assembly Language

Full Marks: 15 Duration: 50 minutes

[Figures in the right margin indicate full marks]

Answer all the following questions.

1. Write down the steps to execute a machine instruction. Illustrate the Intel 8086 Microprocessors organization.

   Define memory segment. Write down the features of 80286 microprocessor.

   Write down the difference between physical and logical memory. A memory location has physical address 80FD2h. In what segment does it have offset BFD2h?

   Which Intel microprocessor addresses 1T of memory? What is the purpose of the microprocessor in a microprocessor-based computer?

   Determine the memory location addressed by the following real mode 80286 register combinations: DS = 1000H and DI = 2000H also draw the diagram of memory access.

Mid Term Examination of B. Sc. Engg. (CSE) January-June 2022

Course Title: Computer Organization and Architecture Course Code : CIT-313

Time: 60 Min Marks: **15**

N.B. *Answer the following questions.* ***(Split answers are highly discouraged)***

1 Describe the structure of SRAM. Distinguish among PROM, EPROM, EEPROM and flash. **4**

2 Why RAM is so called? **1**

3 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. **3**

a. How is a 16-bit memory address divided into tag, line number, and byte number?

b. Into what line would bytes with each of the following addresses be stored?

1100 0011 0011 0100

c. How many total bytes of memory can be stored in the cache?

d. Why is tag stored in the cache?

4 Give the basic elements to design different buses. Describe PCI bus structure. **4**

5 Define interrupts. How do the multiple interrupts managed? **3**

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), January-June/2022, Session: 2019-20

Course Code: CFF-316 Course Title: Artificial Intelligence Sessional

Full Marks: 15 Duration: 1 hour

[Figures in the right margin indicate full marks]

Answer all the following questions.

1.

2.

3. Code the following proposition using PL with python and print the Truth Tables. 05

   a. It is raining outside if and only if it is a cloudy day.
   b. If you get a 100 on the final exam, then you earn an A in the class.
   c. Take either 2 Advil or 3 Tylenol
   d. She studied hard or she is extremely bright.
   e. I am a rock and I am an island.

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: 2019-2020

Course Code	Course Title	January-June-2022	Credit: 03
CCE-311	Numerical Methods		Time: 03 Hr
			Marks: 70

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

1 A A total of 8,600 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 431.25 taka, how much was invested in each account? Use Gauss-elimination Method to calculate the investment in each account. 7

1 B The cost of 4 kg onion, 3 kg wheat and 2 kg rice is 60 taka. The cost of 2 kg onion, 4 kg wheat and 6 kg rice is 90 taka. The cost of 6 kg onion 2 kg wheat, and 3 kg rice is 70 taka. Find the cost of each item per kg by Cramer's rule. 7

2 A Apply Cholesky decomposition to the symmetric matrix. 7

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

2 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

3 A Implement the point-slope strategy to numerically integrate $dy/dx = -2X^3 + 12X^2 - 20X + 8.5$ from X=0 to X=3.0 with a step size 0.5. The initial condition at X=0 is Y=1. 7

3 B 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 $\varepsilon_t = 0.0048\%$. 7

4 A Use bisection method to solve the following problem up to approximate percent relative error $\varepsilon_a <= 0.422$. 7

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

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

5 A 7

i. Derive the formula of false position method with proper figure.
ii. Differentiate between Gauss-Jordan and Gauss elimination method.

5 B Fit a second-order polynomial to the data of the following table. Also find out standard error $S_{y/x}$ 7

x_i	y_i
1	7.7
2	13.6
3	27.2

6 A Show a case where bisection is preferable to false position with a suitable example. 7

6 B Given $dy/dx = \frac{1}{2}(x+y)$, y(0)=2, y(0.5)=2.636, y(1.0)=3.595, y(1.5)=4.968. Find y(2) by Milne's method. 7

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: 2019-2020

Course Code	Course Title	January-June 2022	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.]** Consider the queuing delay in a router buffer, where the packet experiences a delay as it waits to be transmitted onto the link. The length of the queuing delay of a specific packet will depend on the number of earlier-arriving packets that are queued and waiting for transmission onto the link. If the queue is empty and no other packet is currently being transmitted, then our packet's queuing delay will be zero. On the other hand, if the traffic is heavy and many other packets are also waiting to be transmitted, the queuing delay will be long. Assume a constant transmission rate of R = 300000 bps, a constant packet-length L = 4600 bits, and a is the average rate of packets/second. Traffic intensity I = La/R, and the queuing delay is calculated as I(L/R)(1 - I) for I < 1. **4**

i. In practice, does the queuing delay tend to vary a lot? Answer with Yes or No and why?

ii. Assuming that a = 28, what is the queuing delay?

iii. Assuming the router's buffer is infinite, the queuing delay is 0.4357 ms, and 1218 packets arrive. How many packets will be in the buffer 1 second later?

iv. If the buffer has a maximum size of 563 packets, how many of the 1218 packets would be dropped upon arrival from the previous question?

[B.] Some content providers have created their own networks. Describe Google's network. What motivates content providers to create these networks? **3**

[C.] **i.** What is an application-layer message? A transport-layer segment? A network-layer datagram? A link-layer frame? **4**

ii. 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.

iii. In this problem, we consider sending real-time voice from Host A to Host B over a packet-switched network (VoIP). Host A convert's analog voice to a digital 64 kbps bit stream on the fly. Host A then groups the bits into 56-byte packets. There is one link between Hosts A and B; its transmission rate is 10 Mbps and its propagation delay is 10 msec. As soon as Host A gathers a packet, it sends it to Host B. As soon as Host B receives an entire packet, it converts the packet's bits to an analog signal. How much time elapses from the time a bit is created (from the original analog signal at Host A) until the bit is decoded (as part of the analog signal at Host B)? **3**

2 **[A.]** "For the proper operation of the CIDR, three restrictions need to be applied to the allocated block" justify this statement. **3**

[B.] An organization is granted the block 130.34.12.64/26. The organization needs four subnetworks, each with an equal number of hosts. Design the subnetworks and find the information about each network. **4**

[C.] 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**

i. The first group has 200 medium-size businesses; each needs approximately 128 addresses.

ii. The second group has 400 small businesses; each needs approximately 16 addresses.

iii. The third group has 2000 households; each needs 4 addresses.

Design the subblocks and give the slash notation for each subblock. Find out how many addresses are still available after these allocations.

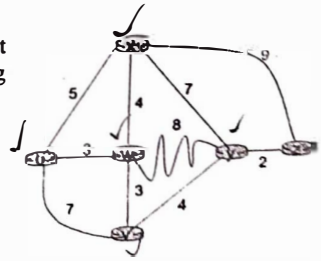
3 **[D.]** "Four levels of addresses are used in an internet employing the TCP/IP protocols and each address is related to a one layer in the TCP/IP architecture" justify this statement. **2**

[A.] **i.** You have an interface on a router with the IP address of 192.168.192.10/29. What is the broadcast address the hosts will use on this LAN? **6**

ii. What is the last valid host on the subnetwork 165.21.80.128/26?

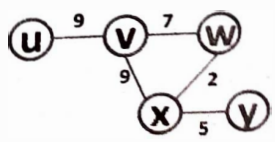
iii. In fixed-length subnetting, find the number of 1's that must be added to the mask if the number of desired subnets will be 2 and 122.

[B.] Construct least-cost-path tree by tracing predecessor nodes. Also find out the resulting least-cost-path tree from u and also show the resulting forwarding table in u: **5**



[C.] **i.** When the algorithm converges, what are the distance vectors from router 'Y' to all routers? Write your answer as u,v,w,x,y. **3**

ii. What are the initial distance vectors for router 'W'? Write your answer as u,v,w,x,y and if a distance is ∞, write 'x'.



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. 5

i. Show the three TCP segments during the connection establishment.
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."
iii. Show the contents of the segments during the connection termination.

[B.] The following is a dump of a UDP header in hexadecimal format: 4
CB84000D001C001C

i. What is the source port number?
ii. What is the destination port number?
iii. What is the total length of the user datagram?
iv. What is the length of the data?
v. Is the packet directed from a client to a server or vice versa?
vi. What is the client process?

[C.] A TCP connection is using a window size of 10,000 bytes and the previous acknowledgment number was 22,001. It receives a segment with acknowledgment number 24,001 and window size advertisement of 12,000. Draw a diagram to show the situation of the window before and after. 3

[D.] Suppose you wanted to do a transaction from a remote client to a server as fast as possible. Would you use UDP or TCP? Why? 2

[A.] A DNS client is looking for the IP addresses corresponding to xxx.yyy.com and aaa.bbb.edu. Show the query message. Also, Show the response message of the DNS server to this query if the addresses are 14.23.45.12 and 131.34.67.89. 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.] Suppose a content provider employs a third-party CDN company to distribute its videos to its customers. How are DASH and DNS used to direct a user's request to the CDN server? Explain the steps with proper illustration. 3

[D.] Encode the following message in quoted-printable: 2
01010111 00001111 11110000 10101111 01110001 01010100

[A.] Consider the following string of ASCII characters that were captured by Wireshark when the browser sent an HTTP GET message (i.e., this is the actual content of an HTTP GET message). The characters *<cr><lf>* are carriage return and line-feed characters (that is, the italized character string *<cr>* in the text below represents the single carriage-return character that was contained at that point in the HTTP header). Answer the following questions, indicating where in the HTTP GET message below you find the answer. 5

GET /cs453/index.html HTTP/1.1*<cr><lf>*Host: gaia.cs.umass.edu*<cr><lf>*User-Agent: Mozilla/5.0 (Windows;U; Windows NT 5.1; en-US; rv:1.7.2) Gecko/20040804 Netscape/7.2 (ax)*<cr><lf>* Accept:ext/xml, application/xml, application/xhtml+xml, text/html;q=0.9, text/plain;q=0.8,image/png,*/*;q=0.5 *<cr><lf>*Accept-Language: en-us,en;q=0.5*<cr><lf>*Accept-Encoding: zip,deflate*<cr><lf>* Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7*<cr><lf>*Keep-Alive: 300*<cr><lf>*Connection:keep-alive*<cr><lf><cr><lf>*

i. What is the URL of the document requested by the browser?
ii. What version of HTTP is the browser running?
iii. Does the browser request a non-persistent or a persistent connection?
iv. What is the IP address of the host on which the browser is running?
v. What type of browser initiates this message?
vi. Why is the browser type needed in an HTTP request message?

[B.] The text below shows the reply sent from the server in response to the HTTP GET message in the question above. Answer the following questions, indicating where in the message below you find the answer. 4

HTTP/1.1 200 OK*<cr><lf>*Date: Tue, 07 Mar 2008 12:39:45GMT*<cr><lf>*Server: Apache/2.0.52 (Fedora)*<cr><lf>*Last-Modified: Sat, 10 Dec2005 18:27:46 GMT*<cr><lf>*ETag: "526c3-f22-a88a4c80"*<cr><lf>*Accept-Ranges: bytes*<cr><lf>*Content-Length: 3874*<cr><lf>*Keep-Alive: timeout=max=100*<cr><lf>*Connection:Keep-Alive*<cr><lf>*Content-Type: text/html; charset= ISO-8859-1*<cr><lf><cr><lf>*<!doctype html public "-//w3c//dtd html 4.0 transitional//en">*<lf>* <html>*<lf>*<head>*<lf>* <meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">*<lf>* <metaname="GENERATOR" content="Mozilla/4.79 [en] (Windows NT 5.0; U) Netscape">*<lf>* <title>CMPSCI 453 / 591 /NTU-ST550ASpring 2005 homepage</title>*<lf>*</head>*<lf>*<*much more document text following here (not shown)*>*

i. Was the server able to successfully find the document or not? What time was the document reply provided?
ii. When the document was last modified?
iii. How many bytes are there in the document being returned?
iv. What are the first 5 bytes of the document being returned? Did the server agree to a persistent connection?

[C.] What will happen when both sender and receiver use Web servers to transfer email, but not necessarily the same server? Illustrate the scenario. 3

[D.] Compare the working principles of YouTube and Netflix. 2

Patuakhali Science and Technology University

Department of Computer Science and Information Technology

5th Semester (Level-3, Semester-I) Final Examination of B.Sc. Engg. (CSE) 2022 (January-June)

Course Code: CTE-311 Course Title: Microprocessor and Assembly Language

Credit Hour: 3.00 Session: 2019-20 Full Marks: 70 Duration: 3 Hours

[Figure in the right margin indicates full marks. Split answering of any question is not recommended. Write the full question number e.g. 1(b) (i) before the answer paragraph]

Answer any 5 of the following questions

1 (a) How large is the Windows application programming area? Distinguish between microcontroller and microprocessor. Give the features of 8051. 05

(b) What are program-visible registers? What is the purpose of the IP/EIP register? Determine the memory location addressed by the following real mode 80286/Core2 register combinations: 05

i. DS = 1000H and DI = 2000H

ii. DS = 2000H and EAX = 00003000H

iii. SS = 8000H and ESP = 00009000H

(c) What is the flat mode memory system? Protected mode memory addressing allows access to which area of the memory in the 80286 microprocessors? 02

(d) What are the differences between a register and a memory location? List one special function for each of the data registers AX, BX, CX, and DX. 02

2 (a) What is wrong with the MOV BL, CX instruction? List the 16-bit segment registers used with register addressing by MOV, PUSH, and POP. 02

(b) What is a displacement? How does it determine the memory address in a MOV DS:[2000H],AL instruction? 02

(c) What do the symbols [ ] indicate? Suppose that DS = 0200H, BX = 0300H, and DI = 400H. Determine the memory address accessed by each of the following instructions, assuming real mode operation: 04

i. MOV AL,[1234H]

ii. MOV EAX,[BX]

iii. MOV [DI],AL

(d) Which base register addresses data in the stack segment? Suppose that DS = 1300H, SS = 1400H, BP = 1500H, and SI = 0100H. Determine the address accessed by each of the following instructions, assuming real mode operation: 04

i. MOV EAX,[BP+200H]

ii. MOV AL,[BP+SI-200H]

(e) What is the difference between an intersegment and intra-segment jump? Show which JMP instruction assembles (short, near, or far) if the JMP THERE instruction is stored at memory address 10000H and the address of THERE is: 02

i. 10020H

ii. 0FFEEH

3 (a) Describe the purpose of the D- and W-bits found in some machine language instructions. If the register field (REG) of an instruction contains 010 and W = 0, what register is selected, assuming that the instruction is a 16-bit mode instruction? 03

(b) Identify the default segment registers assigned to the following: 02

i. SP

ii. EBX

iii. DI

iv. SI

(c) If the start of a segment is identified with .DATA, what type of memory organization is in effect? Convert an 8B07H from machine language to assembly language. 04

(d) What directives indicate the start and end of a procedure? Explain what happens when the PUSH BX instruction executes. Make sure to show where BH and BL are stored. (Assume that SP = 0100H and SS = 0200H.) 03

(e) Write a program to (i) display a "?", (ii) read two decimal digits whose sum is less than 10, (iii) display them and their sum on the next line, with an appropriate message. **02**

Sample execution:

?27

THE SUM OF 2 AND 7 IS 9

4 (a) What is wrong with the ADD RCX, AX instruction? Develop a short sequence of instructions that adds AL, BL, CL, DL, and AH. Save the sum in the DH register. **03**

(b) Explain the difference between the SUB and CMP instruction. Write one or more instructions to do each of the following. Assume overflow does not occur. **03**

i. Multiply the value of AL by 8.

ii. Divide 32142 by 4 and put the quotient in AX.

(c) Explain what the JMP AX instruction accomplishes. Also identify it as a near or a far jump instruction. List the five flag bits tested by the conditional jump instructions. **03**

(d) How many different interrupt types are available in the microprocessor? Explain how the near and far CALL instruction's function. **02**

(e) If it is a legal instruction, give the values of DX, AX, and CF/OF after MUL BX is executed. Given that, AX contains 0008h and BX contains 0003h. Write assembly code for the following decision structure. **03**

IF AX < 0
THEN
PUT -1 IN BX
END IF

5 (a) i. "CPU actually works on binary digits"- Justify this statement. **2+2**

ii. Enlist the major evolution in computational era with its key technology.

(b) Explain the learning outcome from this course. **3**

(c) Give advantages and disadvantages of flags in CPU. Give the flag status of flag register after performing the following operation. **2+2**

$$\begin{array}{r} ABCD \\ \times A \\ \hline \end{array}$$

(d) i. Distinguish between coprocessor and peripheral. **1.5+1.5**

ii. Mention the features of 80287.

6 (a) Explain the responsibilities of segment register in protected mode memory addressing. If DS=0105H in a protected mode system, which entry, table, and requested privilege level are selected? **4**

(b) i. Why is accumulator so called? **1.5+1.5**

ii. Enlist the differences between 8086 and 8088 microprocessors.

(c) i. Explain handshaking with respect to CPU. **1.5+2.5**

ii. Describe addressing modes of DSP56300. Explain trigger of DMA.

(d) i. How does 82C55 can be programmed? **1.5+1.5**

ii. Distinguish among the various mode of operation of 82C55.

Patuakhali Science and Technology University

Department of Computer Science and Information Technology

[illegible] Semester Final Examination of B.Sc. Engg (CSE) January-June/2022, Session 2019-20
Course Code: [illegible] Microprocessor and Assembly Language Sessional
Full Marks: ?0 Duration: 3 hours

[illegible]

Answer all the following questions

SET-A

1. Write a program to add [illegible] numbers as well as form a Fibonacci series. 15
2. Write some code to sum in AX the elements of the 10-element array W defined by 15

   W DW 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

3. Replace each lowercase letter in the following string by its upper case equivalent. Use index addressing mode. 15

   MSG DB 'this is a message'

4. Implement Stack and insert, update and delete from it 15
5. Implement Queue and insert, update and delete from it 15
6. Write a program to subtract two 16 bit numbers with or without borrow 15
7. Write a program for Binary to Decimal Conversion 15
8. Write a program to find the factorial of a number 15
9. Write a program for Decimal to Binary Conversion 15
10. Suppose A is a 5 x 7 word array stored in row-major order. Write some code to (1) clear row 3, (2) clear column 4. Use based indexed mode. 15
11. Write a program that prompts the user to enter a character and prints the ASCII code of the character in hex on the next line. Repeat this process until the user types a carriage return. 15

    Sample execution:

    TYPE A CHARACTER: Z

    THE ASCII CODE OF Z IN HEX IS: 5A

    TYPE A CHARACTER:

12. Write a program that will prompt the user to enter a hex digit character ("0" ... "9" or "A" ... "F"), display it on the next line in decimal, and ask the user that he or she wants to do it again. If the user types "y" or "Y", the program repeats; If the user types anything else, the program terminates. If the user enters an illegal character, prompt the user to try again. 15
13. Demonstrate looping by printing a series of numbers. 15
14. SET-B (Attachment will provide) 15
15. Microcontroller Based Hardware Project 30
16. Viva-Voce 10

Patuakhali Science and Technology University
Department of Computer Science and Information Technology
B.Sc. Engg. (CSE) 5th Semester (L-III, S-I), January-June/22
Course Code: CIT-313 Course Title: Computer Organization and Architecture
Credit Hour: 3.00 Session: 2019-2020 Full Marks:70 Duration: 3 Hours

*[Figure in the right margin indicates full marks. **Answer should be short, neat and clean.** Split answering of any question is not recommended.]*

Answer any 5 of the following questions.

1. a) Give the learning outcomes from this course with respect to your current and forthcoming professional perspective. 4
   b) i. What is computer family? 1
   ii. Find out the quotient and reminder by performing two's complement division operation where divisor = -4 and dividend = -7. 4
   c) i. Assume numbers are represented in 6-bit two's complemented representation. Show calculation of the following. 2

   -A+B (Hex)

   ii. Enlist the categories of computer's functions. What is the difference between arithmetic shift and logical shift? 1+2

2. a) Give the technological features for switching computer generation. Also mention the key technological development for any 2 consecutive generation in current era. 4
   b) i. Give the comparative discussion between 2's complement and sign magnitude representation. 2
   ii. Explain variable length instruction with example. Explain the issues regarding a instruction set design. 3
   c) Mention the advantages and disadvantages of condition codes. 2
   "Each operation needs operand"-justify this statement. Briefly describe various categories of operand. 3

3. a) Distinguish among direct, associative and set associative mapping of cache. 2
   b) i. For hexadecimal main memory addresses F000EE, FABCEF, show the following information in hexadecimal format. (Where cache size is 64 KBytes). 5
      a. Tag, Line and Word values for a direct mapped cache.
      b. Tag, Set and Word values for two-way set associative cache.
   ii. Explain different replacement algorithms with respect to cache memory.
   c) i. Why is SRAM so called? Distinguish between SRAM and DRAM. 2.5
   ii. Explain the SRAM structure. 2.5
   d) Distinguish between EPROM, EEPROM. 2

4. a) What is RAID? Explain error detection and error correction mechanisms in semiconductor memory. 4
   b) Give the technological features of the storage tape, CD, DVD, HDD, SSD, flash. 2
   c) Why input/output module is used in computer system? Describe the functions of I/O module. 2+2
   d) Shortly explain peripheral devices with its classification. Distinguish between program driven and interrupt driven I/O. 2+2

5. a) i. Describe pipelining. How can the pipeline be sustained in case of branch dealing? 1+2
   ii. "Pipeline processor with k stages is k time faster than non-pipeline processor" justify this statement. 2
   b) i. Why interrupts is used in computer system? Classify interrupts. 2.5
   ii. How does the processor handle multiple interrupts? 2.5
   c) i. Enlist different addressing mechanism. 1.5
   ii. Illustrate the effective address EA = (A) + (R) where, A = base value, R = register that holds displacement. 2.5

6. a) i. Determine the number of page table entries that are needed for the following combinations of virtual address size (n) and page size (P). 1+3

n	P=2^p	#PTE
32	4K	
64	8K	

   ii. How does the page fault handle in VM system.
   b) Distinguish between CISC and RISC. 3
   c) Explain the micro-operations for executing the following instruction with respect to IAS architecture. 3

   ADD AX, 3

   d) The following performance measures were recorded when executing a set of benchmark programs for a machine. 1+3

Instruction category	Percentage of occurrence	No. of cycles per instruction
ALU	40	2
Load & Store	17	3
Branch	40	5
Others	3	6

Assume that the execution of 350 instructions and the clock rate of the CPU is 1.2 GHz. Calculate CPU time, CPI and MIPS.

Patuakhali Science and Technology University

B.Sc. Engg. (CSE) 5th Semester (Level-3, Semester-I) Final Examination January-June 2022

Course code: CIT-315 Course Title: Artificial Intelligence

Session: 2019-20 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 does artificial intelligence mean? List the learning outcomes of AI. **3**

(b) Define in your own words the following terminologies: agent, agent program, rationality, autonomy, deterministic, and stochastic. **6**

(c) What is PEAS in specifying the task environment? Illustrate and describe the structure of the model-based reflex agent. **5**

2. (a) What is an uninformed search? Compare breadth first search, BFS, and depth first search, DFS, algorithms. Show that the 8-puzzle states are divided into two disjoint sets, such that no state in one set can be transformed into a state in the other set by any number of moves. **5**

(b) Prove that uniform-cost search and breadth-first search with constant step costs are optimal when used with the GRAPH-SEARCH algorithm. Show a state space with constant step costs in which GRAPH-SEARCH using iterative deepening finds a suboptimal solution. **2+2=4**

(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. **1+4=5**

3. (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. **2+3=5**

(b) What are the reasons, problems, of the hill-climbing algorithm for getting stuck? How to escape these problems using the simulated-annealing search algorithm? **5**

(c) 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. **2+2=4**

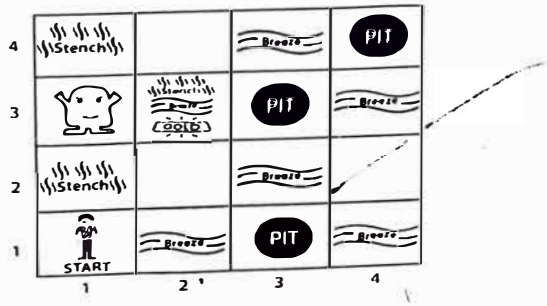
4. (a) Define the following terminologies in your own words: conditional probability, Bayes' rule, supervised learning, unsupervised learning. **3**

(b) 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. Design a naïve Bayes model, Bayesian classifier based on the dentistry example. **2+3=5**

(c) How to compute entropy and information gain from attributes in datasets for building decision tree as a classifier? What is a univariate linear regression? How to minimize the loss using gradient descent for fitting linear regression? **6**

5. (a) Define logical agent. Describe about knowledge representation language. **02**

(b) What are the characteristics of the wumpus world problem? Develop propositional rules for the wumpus world and prove that wumpus is static in (1,3). Now prove that the Wumpus is in (1,3). **06**



02

(c) Which of the following are correct? Clarify.

i. $(A \wedge B) \models (A \Leftrightarrow B)$.

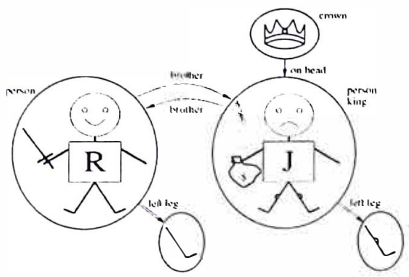
ii. $A \Leftrightarrow B \models \neg A \vee B$.

iii. $A \vee B) \wedge (\neg C \vee \neg D \vee E) \models (A \vee B \vee C) \wedge (B \wedge C \wedge D \Rightarrow E)$.

iv. $(A \wedge B) \Rightarrow C \models (A \Rightarrow C) \vee (B \Rightarrow C)$.

(d) What are the purposes of natural language processing with AI? Describe N-gram character model? How HITS algorithm played important roles in developing our understanding of web information retrieval. **04**

6. (a) Define quantifiers. Consider the following model containing five objects, two binary relations, three unary relations (indicated by labels on the objects), and one unary function, left-leg develop first order logic for the model for the following facts. **02**



i. King John is a king ⇒ King John is a person.

ii. King John and King Richard are siblings

(b) Translate the following English sentences to first order logic. **06**

i. Every gardener likes the sun.

ii. You can fool some of the people all of the time.

iii. You can fool all of the people some of the time.

iv. All purple mushrooms are poisonous.

v. There are exactly two purple mushrooms.

vi. Clinton is not tall.

(c) Consider the facts husband(Joe, Mary), son(Fred, Joe), spouse(John, Nancy), male(John), son(Mark, Nancy), father(Jack, Nancy), daughter(Linda, Jack), daughter(Liz, Linda) and following rules for genealogical relations **03**

i. $(\forall x,y)$ parent(x, y) ↔ child (y, x)

ii. $(\forall x,y)$ father(x, y) ↔ parent(x, y) ∧ male(x) (similarly for mother(x, y))

iii. $(\forall x,y)$ daughter(x, y) ↔ child(x, y) ∧ female(x) (similarly for son(x, y))

iv. $(\forall x,y)$ husband(x, y) ↔ spouse(x, y) ∧ male(x) (similarly for wife(x, y))

v. $(\forall x,y)$ spouse(x, y) ↔ spouse(y, x)

vi. $(\forall x,y)$ parent(x, y) → ancestor(x, y)

vii. $(\forall x,y)(\exists z)$ parent(x, z) ∧ ancestor(z, y) → ancestor(x, y)

viii. $(\forall x,y)$ descendant(x, y) ↔ ancestor(y, x)

ix. $(\forall x,y)(\exists z)$ ancestor(z, x) ∧ ancestor(z, y) → relative(x, y)

x. $(\forall x,y)$ spouse(x, y) → relative(x, y) (related by marriage)

xi. $(\forall x,y)(\exists z)$ relative(z, x) ∧ relative(z, y) → relative(x, y)

xii. $(\forall x,y)$ relative(x, y) ↔ relative(y, x)

Now find the result of the queries **(a) ancestor(Jack, Fred, (b) relative(Liz, Joe) (c) relative(Nancy, Matthew)**

(d) In each of the following, given an English sentence and a number of candidate logical expressions. For each of the logical expressions, state whether it (1) correctly expresses the English sentence; (2) is syntactically invalid and therefore meaningless; or (3) is syntactically valid but does not express the meaning of the English sentence. **03**

A. Every cat loves its mother or father.
   (i) ∀ x Cat (x) ⇒ Loves(x, Mother (x) ∨ Father (x)).
   (ii) ∀ x ¬Cat(x) ∨ Loves(x, Mother (x)) ∨ Loves(x, Father (x)).

B. Every dog who loves one of its brothers is happy.
   (i) ∀ x Dog(x) ∧ (∃y Brother (y, x) ∧ Loves(x, y)) ⇒ Happy(x).
   (ii) ∀ x, y Dog(x) ∧ Brother (y, x) ∧ Loves(x, y) ⇒ Happy(x).

C. No dog bites a child of its owner.
   (i) ∀ x Dog(x) ⇒ ¬Bites(x, Child (Owner (x))).
   (ii) ¬∃ x, y Dog(x) ∧ Child (y, Owner (x)) ∧ Bites(x, y).

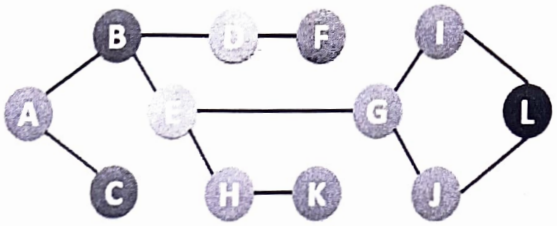
Patuakhali Science and Technology University

B.Sc. Engg.(CSE) 5th Semester (Level-3 Semester-I) Final **Sessional Examination** of January-June 2022

Course Code: CIT-315 Course Title: Artificial Intelligence Sessional

Session 2019-20 Credit Hour: 1.5 Full Marks: 70 Duration: 2.50 Hours.

1. Implement BFS and DFS algorithms based on the following graph. Show the running time of these two algorithms, which have to satisfy the time complexity properties of them. 10



2. The **N** Queen is the problem of placing **N** chess queens on an **N×N** chessboard so that no two queens attack each other. Implement the solution of 8 queen problem from an initial state in Fig. 2.1 to the goal state in Fig. 2.2 using the Hill Climbing algorithm. Queen and empty states can be represented as 1, 0 respectively. 10

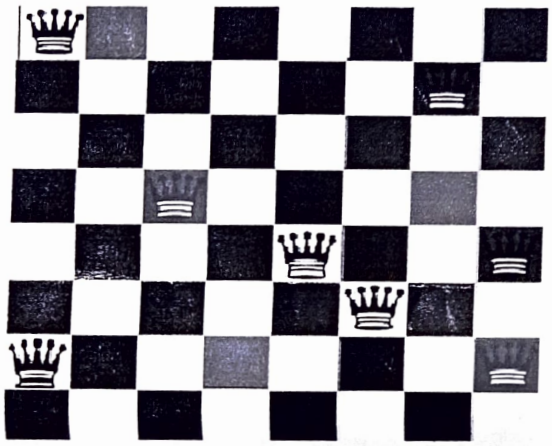


Fig. 2.1: Initial State of 8 Queens

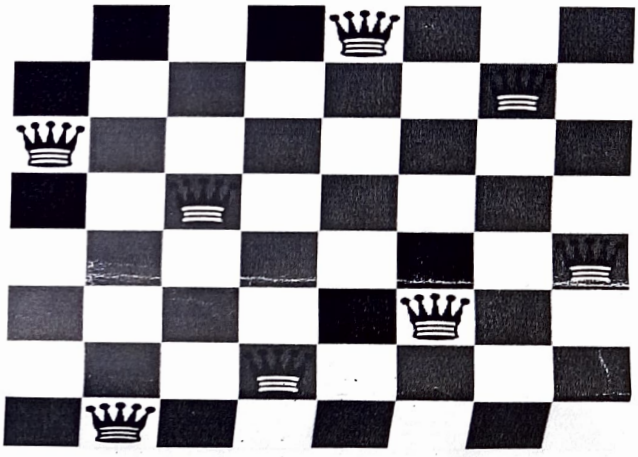


Fig. 2.2: Goal State of 8 Queens

3. Build a Decision Tree based on the following dataset. Test the new case with your Decision Tree. 10

Outlook	Temperature	Humidity	Windy	Play
sunny	hot	high	false	no
sunny	hot	high	true	no
overcast	hot	high	false	yes
rainy	mild	high	false	yes
rainy	cool	normal	false	yes
rainy	cool	normal	true	no
overcast	cool	normal	true	yes
sunny	mild	high	false	no
sunny	cool	normal	false	yes
rainy	mild	normal	false	yes
sunny	mild	normal	true	yes
overcast	mild	high	true	yes
overcast	hot	normal	false	yes
rainy	mild	high	true	no

4. From Mahabub sir 20
5. Viva-voce. 20

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Set B

01. Consider the following simple family scenario: 10

Define the Predicates:

Parent(x, y): Indicates that x is the parent of y.

Parent(y, z): Indicates that y is the parent of z.

Grandparent(Parent(x, y), z): Indicates that x is the grandparent of z

Statements addressing the family:

Parent(Jhon, Mary): Jhon is Mary's father.

Parent (Mary, Joe): Mary is Joe's mother.

By using First Order Logic, we can conclude.

Now prove Grandarent(Jhon, Joe)

Because Jhon is the father of Mary (Parent(Jhon, Mary)) and Mary is the mother of Joe (Parent(Mary, Joe)), as it can infer that Jhon is also the grandfather of Joe.

02. Artificial Intelligence based project. 15