

1. Briefly discuss about the role of lexical analyzer and parser. 4
2. Transition diagram for unsigned numbers. 3
3. Calculate the first and follow functions for the given grammar- 6

$$S \rightarrow (L) / a$$

$$L \rightarrow SL'$$

$$L' \rightarrow ,SL' / \in$$

4. Design grammars for the following languages:

iv.  $\{w \in \{0,1\}^* \mid w \text{ contains at least three } 1s\}$

v.  $\{w \in \{0,1\}^* \mid \text{the length of } w \text{ is odd and the middle symbol is } 0\}$

vi.  $L = \{x \in \{0, 1\}^* \mid x \text{ ends with } 1 \text{ and does not contain the substring } 00\}$

5. Give a RE and a DFA/NFA for the language of all strings over  $\{0, 1\}^*$  that do not end in 01. 2+4

6. Consider the following CFG:

$$S \rightarrow (L) \mid a \text{ and } L \rightarrow L, S \mid S$$

with string ((a,a),a,(a)).  
Give a leftmost derivation and parse tree for the string.

1. Define SDT. Briefly explain the types of SDT.
2. Define intermediate code generator. Explain its types with example.
3. Differentiate between CISC and RISC.

SC. (L)  
Level 3 Semester II, Course Code: CS333, Credit: 3  
Course Title: Web Engineering

### Quiz Test (20 minutes)

- 1) Write HTML code that display the following table.

Employee Information

ID	Name	Age	Job	Income
101	Rahim	28	Programmer	\$3000
102	Karim	31	Teacher	\$4000
103	Sumon	24	Engineer	\$4500

- 2) Define semantic web. What are the parameters used for the successful communication in web? Explain them.

Hajee Mohammad Danesh Science and Technology University, Dinajpur

Department of Computer Science and Engineering

B. Sc. (Engineering) in Computer Science and Engineering

Level 3 Semester II, Course Code: CSE 355, Credit: 2.0

Course Title: Web Engineering

### Quiz Test (20 minutes)

- 1) Write HTML code that display the following table.

5

Employee Information

ID	Name	Age	Job	Income
101	Rahim	28	Programmer	\$3000
102	Karim	31	Teacher	\$4000
103	Sumon	24	Engineer	\$4500

- 2) Define semantic web. What are the parameters used for the successful communication in web? Explain them.

5

Time: 35 Minutes

Full Marks: 20

Answer any 2 (two) questions

- |    |    |   |   |
|----|----|---|---|
| 1. | a) | Define web. What are the challenges of web?   | 2 |
|    | b) | Distinguish between people centric web and machine centric web.   | 3 |
|    | c) | What is HTML? Explain the structure of the HTML webpage with an example.  | 3 |
|    | d) | How can you link one page to another page on a website by using an anchor tag?  | 2 |
| 2. | a) | How XML is differ from HTML?  | 2 |
|    | b) | Generate an ordered list of Science & Technology University of Bangladesh that is started with the number I.  | 3 |
|    | c) | Define Table tag and their attributes with an example.  | 3 |
|    | d) | Write the XML code that display the following output: "Pluto has been discovered in 1930"   | 2 |
| 3. | a) | Define RDF? Describe RDF Triple.  | 3 |
|    | b) | Write short notes about Blank nodes.  | 2 |
|    | c) | What is the logical translation using FOL of the following statements?<br>I. "All kids love Ice-cream" $\forall x \text{ Kids}(x) \rightarrow \text{LoveIceCream}(x)$ .<br>II. "The father of a person is its male parent" $\forall x \forall y \text{ Father}(x, y) \leftrightarrow (\text{Male}(x) \wedge \text{Parent}(x, y))$ . | 3 |
|    | d) | Write the appropriate logical formula to represent the statement<br>"If it rains and the street does not get wet, then the moon is made of green cheese."<br>by using the following assertion:<br>The Moon is made of green cheese: g, It rains :r, and The street is getting wet: n.   | 2 |

(2x)(2x)(2x)

Time: 1 hour

Answer any THREE

1. a) Draw a diagram using the typical network components for a traditional client-server architecture and mark the network boundaries and key interfaces in the diagram. 2  
b) What are two reasons for using layered protocols? What is one possible disadvantage of using layered protocols? Explain with examples. 3  
c) What is Encapsulation? A system has an n-layer protocol hierarchy. Applications generate messages of length M bytes. At each of the layers, an h-byte header is added. What fraction of the network bandwidth is filled with headers? 5
2. a) Differentiate between modulation and coding. For the following lookup table, deduce the code bits using the 4B/5B encoding and draw the encoded signal for the Message: 1110 1111 0001 0000.  
Lookup Table: 0000 → 1110, 0001 → 0100, 1110 → 1100, .... 1111 → 1101 5  
b) An image is  $1600 \times 1200$  pixels with 3 bytes/pixel. Assume the image is uncompressed. How long does it take to transmit it over a 56-kbps modem channel? Over a 1-Mbps cable modem? Over a 10-Mbps Ethernet? Over 100-Mbps Ethernet? Over gigabit Ethernet? 5
3. a) What are the key differences between byte stuffing and bit stuffing? Compare the efficiency of byte stuffing and bit stuffing in terms of overhead introduced. Under what conditions might one method introduce significantly more overhead than the other? 5  
b) Given the data frame A B FLAG C FLAG D, apply byte stuffing to this frame. Show the steps involved in the byte-stuffing process. Assume ESC is the escape character and FLAG is the frame delimiter. 5
4. a) What are the advantages of fiber optics over copper as a transmission medium? Is there any downside to using fiber optics over copper? 2  
b) A Hamming code is constructed to detect and correct single-bit errors. Given the 7-bit codeword 1011101:  
(i) Calculate the number of parity bits required.  
(ii) Identify the positions of the parity bits and explain their placement.  
(iii) Calculate the values of the parity bits.  
(iv) Verify if the received codeword 1011101 is correct or if there are any errors. If errors are found, correct them. 8

B. Sc. CSE, HSTU. Quiz#1 Exam, Level 3 Semester II, Course Title: Software Engineering, Course Code: CSE 361, Credit: 3.0

**Time: 25 Minute**

**Total Marks: 15**

6. Is absolute zero a ratio or interval scale? 2
7. Calculate measures of central tendency of the dataset: 32, 23, 24, 38, 28, 31, 35, 29, 26, 36 3
8. Define Type 1 and Type 2 errors with an example. 3
9. Discuss Overfitting and Underfitting problem in ML model, and how we can address these issues? 3
10. Explain local and global minima in terms of an optimization algorithm. 2+2  
3
- b) What is Work Factor? Use the Caesar cipher method to decrypt the message "SGOOOU", where the shift key is 12. [consider, A=0 to Z=25] 1+4
- c) Explain the basics of Steganography. Describe different types of cryptanalytic attacks. 1+4  
2+3

B.

Sc. CSE, HSTU. Mid Exam, Level 3 Semester II, Course Title: Mathematical Analysis for Computer Science, Course Code: CSE 361

**Time: 50 Minute**

**Total Marks: 30**

1. a) What is probability complement? Suppose two unbiased dice are rolled, what are the odds of getting a sum of 4 or 6?  
b) State Little's Theorem? Explain the simplified notation of queuing a system.  
c) During the rush hours, in HSTU cafeteria, customers arrive at the rate of 10/hour and the service rate is 0.2/min. Find average number of customers in the system? Average time a customer spends in line? [Consider M/M/1 QS]
2. a) Define probability. Discuss different types of events with notation and example.  
b) What is Work Factor? Use the Caesar cipher method to decrypt the message "SGOOU", where the shift key is 12. [consider, A=0 to Z=25]  
c) Explain the basics of Steganography. Describe different types of cryptanalytic attacks.

1+4  
1+4  
2+3

Hajee Mohammad Danesh Science and Technology University, Dinajpur

Department of Computer Science and Engineering

B.Sc. (Engineering) in CSE

Mid Term Examination 2022 (Jul-Dec)

Level 3 Semester II, Course Code: CSE 353, Credit: 3.0

Course Title: Operating System

Time: 50 Minutes

Marks: 30

1. What is inter process communication? Write a way to achieve mutual exclusion. 10
2. Write the reasons for which a process can terminate. Briefly explain how the shortest job first algorithm works. 10
3. Explain when virtual memory is needed. Consider the page references 7,0,3,2,0,1,3,4,2 with 4 page frames. Show how many page faults occur here using optimal page replacement algorithm. 10

Time: 2 Hours

Full Marks: 60

[N.B. The figure in the right margin indicates the marks for the respective question and  
the split answer to any question is unacceptable]

Section-A

Answer any 3 (three) questions

1. a) Define web. Distinguish between people centric web and machine centric web. 3  
b) How do you separate a section of texts in HTML? 2  
c) Generate an ordered list of some public university of Bangladesh that is started with the number III. 3  
d) What are the different types of headings in HTML? 2
2. a) Define semantic web. What are the parameters used for the successful communication in web? Explain them. 5  
b) How XML is differ from HTML? 2  
c) Write the output of the following HTML code.  

```
<html>
<body>
<h1>Unordered List with Disc Bullets</h2>
<ul style="list-style-type:disc;">
<li>Coffee</li>
<li>Tea</li>
<li>Milk</li>
</ul>
</body>
</html>
```

1  
d) How do you insert an image in the HTML webpage? 1
3. a) What are the differences between HTML and CSS? 2  
b) Write the output of the following HTML code.  

```
<html>
<body>
<h1>HTML Links</h2>
<p>HTML links are defined with the a tag:</p>
<a href="https://www.hstu.ac.bd">This is a link</a>
</body>
</html>
```

3  
c) How do you add color to the text in HTML? 2  
d) List the differences between HTML and HTML 5. 3
4. a) Define RDF. Describe RDF Triple. 3  
b) Explain RDF Serializations and Blank Nodes with example. 3  
c) Distinguish between container and collections of RDF lists. 2  
d) How do you add JavaScript to an HTML webpage? 2

B ← for a

1. a) Define PHP. What are some of the popular frameworks in PHP? 3  
 b) Is PHP a case-sensitive language? If yes/ no, then justify your answer. 3  
 c) What are the differences between "echo" and "print" in PHP? 2  
 d) List the different types of PHP errors. 2
2. a) Explain the difference between \$message and \$\$message. 2  
 b) Mention the name of different types of variables present in PHP. 3  
 c) List the key features of PHP. 2  
 d) What is the difference between == and === operators in PHP? 3
3. a) Write the rules for naming a PHP variable. 2  
 b) Differentiate between GET and POST methods in PHP. 3  
 c) Write the output of the following PHP code.
- ```
<html>
<body>
<?php
$color1 = "red";
$color2 = "blue";
$color3 = "green";
echo "My car is ". $color1 . "<br>";
echo "My house is ". $color2 . "<br>";
echo "My boat is ". $color3 . "<br>";
?>
</body>
</html>
```
- d) Write the output of the following PHP code. 2
- ```
<html>
<body>
<?php
$txt1 = "Hello";
$txt2 = " world!";
$txt1 .= $txt2;
echo $txt1;
?>
</body>
</html>
```
4. a) Define Propositional Logic (PL). Write the syntax and meaning of logical connectives for PL. 3  
 b) Write the appropriate logical formula to represent the statement "If it rains and the street does not get wet, then the moon is made of green cheese.". by using the following assertion:  
 The Moon is made of green cheese: g, It rains: r, and The street is getting wet: n. 2  
 c) Distinguish between tautology and refutable 3  
 d) What is the logical translation using FOL of the following statements?  
 i. "All kids love Ice-cream"  
 ii. "The father of a person is its male parent"

$$(\gamma \wedge \neg \eta) \rightarrow \delta$$

**[N.B. The figure in the right margin indicates the marks allocated for the respective question.  
Split answer to any question is not allowed.]**

### Section-A

*(Answer any 03(three) from the following questions)*

1. (a) Explain Linear Optimization and its properties with an example. Write its applications. 3+2  
 (b) Solve the following LPP using Graphical Method by illustrating the feasible region. 5

$$z = 5x + 4y$$

which subjects to:  $x + y \leq 6$ ,  
 $2x + y \geq 8$ , and  
 $x \geq 0, y \geq 0$

- (c) Explain the Fourier Series equations for even and odd functions with examples. 5

2. (a) Define hypothesis testing. Describe Type 1 and Type 2 errors with an example. Which error is more crucial in clinical experiments? 1+3+1  
 (b) What is confusion matrix? Calculate Recall, Precision, F1-Score, Accuracy from the given multiclass confusion matrix. 1+4

		Actual Class		
		+ve	θ	-ve
Predicted class	+ve	178	23	43
	θ	9	112	46
	-ve	12	32	90

- (c) Describe the security goals of Cryptography. What are the components of Steganography? 3+2

3. (a) Briefly describe the general structure of the Data Encryption Standard algorithm's round key generation process. 5  
 (b) What is Work Factor in cryptosystem? Use the Caesar cipher method to decrypt the message "PQRQJQRQ", where the shift key is 8. [consider, A=0 to Z=25] 1+4  
 (c) Explain RSA Algorithm. Describe different types of cryptanalytic attacks. 2+3

4. (a) Discuss Markov Chain and its applications. 2+2  
 (b) Considering Markov process, draw the state diagram from the following transition matrix and calculate the probability of the sequence: CHILL 2+4

	I	C	H	L
I	0.00	0.23	0.09	0.12
C	0.17	0.12	0.41	0.00
H	0.32	0.32	0.11	0.00
L	0.00	0.35	0.25	0.40

- (c) Find the Laplace Transformation:  $L\{at\}$ . 5

### Section-B

(Answer any 03(three) from the following questions)

- |    |  |       |
|----|--|-------|
| 1. | (a) Define linear model. Write its properties and applications.  | 1+4   |
|    | (b) Describe the function requirements in Gradient Descent optimization algorithm. Also explain local and global minima in terms of this algorithm.  | 2+3   |
|    | (c) What is absolute zero in measurement scales? Calculate measures of central tendency of the dataset: 6, 5, 16, 23, 10, 9, 12, 18, 15, 13, 21, 12, 7, and <del>2</del> .   | 1+4   |
| 2. | (a) Define variance, covariance and correlation. Calculate the standard deviation of the given dataset: $X = 2.1, 2.5, 4.0, 3.9$   | 3+2   |
|    | (b) Discuss Overfitting and Underfitting problem in ML models, and how we can address these issues?  | 2+2   |
|    | (c) Describe different types of events in probability with notation and example. Suppose three unbiased dice are rolled, what is the probability that the two dice scores same?  | 3+3   |
| 3. | (a) Describe normal distribution and its properties.   | 3     |
|    | (b) Define queueing system and its different types? What is the standard notation of queuing a system? Describe the meaning of each symbol using M/M/10/20/30.   | 3+1+2 |
|    | (c) Dinajpur Railway Station has a single ticket counter. During the rush hours, customers arrive at the rate of 0.1667 per minute. The average number of customers that can be processed by the counter is 12 per hour. Based on this information, find the followings:<br>i. Probability that the ticket counter is idle<br>ii. Average number of customers in the queuing system<br>iii. Average time a customer spends in the waiting line<br>iv. Average time a customer spends in the system | 1.5x4 |
| 4. | (a) What is imbalanced data? How to deal with this type of data?   | 2+2   |
|    | (b) State Little's Theorem. Derive the mean of Poission process considering distribution of arrivals in the queueing system.   | 2+4   |
|    | (c) Write the properties of Z-score. Consider a dataset: {2, 7, 3, 12, 9, 15} and calculate the Z-score of the 4 <sup>th</sup> individual data point ( $X=12$ ) in the dataset.  | 2+3   |

Hajee Mohammad Danesh Science and Technology University, Dinajpur  
 Department of Computer Science and Engineering  
 B.Sc. (Engineering) in Computer Science and Engineering  
 Semester Final Examination 2022  
 Level 3, Semester II, Course Code: CSE 359, Credit: 3.0  
 Course Title: Compiler Design

Time: 3 hours

Total Marks: 90

*[N.B. The figure in the right margin indicates the marks allocated for the respective question.  
The split answer of any question is not allowed.]*

Section-A

Answer any 03(three) from the following questions (1-4)

1. a) Briefly describe about the phases of a compiler. 10  
b) Define CFG. Discuss about the components of CFG. 5
2. a) How many types of operations are there on languages? Explain them with definition and notation. 1+5  
b) Give some reasons why the analysis portion of a compiler separated into lexical analysis and parsing phases. 5  
c) Define input buffering and sentinels. 4
3. a) Is the following grammar ambiguous? If so, prove it and construct a non-ambiguous grammar that derives the same language.  
 $S \rightarrow aS \mid aSbS \mid c$  7  
b) Write the rules of how to select a leader. 3  
c) Draw a transition diagram for relop (considering  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ ,  $\neq$ ,  $=$ ). 5
4. a) Determine FIRST and FOLLOW sets for the following grammar:  
 $S \rightarrow (L) \mid a$   
 $L \rightarrow SL$   
 $L' \rightarrow ,SL' \mid \epsilon$  7  
b) Make up the predictive parsing table by following any suitable algorithm and considering the grammar in the above question 4. a). 4  
c) Re-write the following grammar after eliminating the left-recursion through applying a suitable algorithm.  
 $S \rightarrow Aa \mid b$   
 $A \rightarrow Ac \mid Sd \mid \epsilon$  4

Section-B

Answer any 03(three) from the following questions (1-4)

1. a) Describe the languages denoted by the following regular expressions: 3
  - i.  $((\epsilon \mid a)b^*)^*$
  - ii.  $(a \mid b)^*a(a \mid b)(a \mid b)$
  - iii.  $a^*ba^*ba^*ba^*$

- b) Write RE for the following languages:
- All strings starting and ending with a having any combinations of b's in between.
  - All strings of a's and b's that do not contain the substring abb.
  - $L = \{x \in \{0, 1\}^* \mid x \text{ ends with } 1 \text{ and does not contain the substring } 00\}$
- c) Design CFG for the following languages:
- $\{w \in \{a,b\}^* \mid w \text{ has the same number of a's and b's}\}$
  - $\{w \in \{a,b\}^* \mid w \text{ is a palindrome}\}$
  - $\{w \in \{a^n \mid n \geq 1\}$
2. a) Briefly describe about the common programming errors with example. 6
- b) Generate three address code for the following expressions: 5  
 $m+n*y-z/(n*y)$
- c) Differentiate between regular expressions and grammars. 5
3. a) Convert the following diagram from NFA to DFA using subset construction method. 7
- 
- ```

graph LR
    S(( )) --> A((A))
    A -- 0 --> A
    A -- ε --> B((B))
    B -- 1 --> B
    B -- 0 --> C(((C)))
    B -- ε --> D((D))
    C -- 0 --> C
    D -- 0 --> D
  
```
- b) Differentiate between the two types of syntax directed translation. 4
- c) Write short notes on: 4
- Left recursion
  - Left factoring
4. a) Translate the arithmetic expression  $a+-(b+c)$  into: 6
- Syntax tree
  - Quadruples
  - Triples
- b) Determine the cost of the following instructions: 3+3
- $LD R0, C$
    - $LD R1, i$
    - $MUL R1, R1, 8$
    - $ST a(R1), R0$
  - $LD R0, R1$
    - $LD R1, x$
    - $SUB R0, R0, R1$
    - $BLTZ *R3, R0$
- c) Construct the DAG for the following block: 3
- $$\begin{aligned}
 a &= b + c \\
 b &= a - d \\
 c &= b + c \\
 d &= a - d
 \end{aligned}$$

Section-A

(Answer any three from the following questions)

1. a) What are two reasons for using layered protocols? What is one possible disadvantage of using layered protocols? Explain with examples. 2+2  
 b) What is Encapsulation? A system has an n-layer protocol hierarchy. Applications generate messages of length M bytes. At each of the layers, an h-byte header is added. What fraction of the network bandwidth is filled with headers? 2  
 c) In the internet protocol stacks, why the IP layer is called a Narrow waist? 1  
 d) Given a network link with a propagation speed of  $2 \times 10^8$  meters per second and a distance of 300 kilometers between two nodes, calculate the propagation delay. 1
2. a) Compare the characteristics of twisted pair cables, coaxial cables, and fiber optic cables. 3  
 b) Mention how 4B/5B encoding solves the problem of long sequences of 1s or 0s that can make clock recovery difficult in NRZ encoding. For the following lookup table, deduce the code bits using the 4B/5B encoding and draw the encoded signal for the Message: 1110 1111 0001 0001.  
 Lookup Table: 0000 → 11110, 0001 → 01001, 1110 → 11100, ..., 1111 → 11111. 2+2
- ✓ Discuss the advantages and disadvantages of using byte stuffing and bit stuffing in network protocols. Given the data sequence A B ESC C D FLAG E F and the special characters FLAG and ESC, show the resulting sequence after byte stuffing is applied. 3  
 ✓ For the bit sequence 0111110 0111110 11110 0111110, apply bit stuffing assuming the delimiter flag is 0111110. Show the resulting sequence after bit stuffing. 3
3. a) Mention the purpose of the Internet Checksum and how it is used in network protocols. Prove that the Internet Checksum of a packet is the one's complement of the one's complement sum of all 16-bit words in the packet. 3  
 b) A 7-bit data 1101010 needs to be transmitted using a CRC with a generator polynomial  $x^5 + x + 1$ . Calculate the CRC code and show the transmitted frame. Show each step of the calculation. 4  
 c) What is the Hamming distance and why is it important in the context of error detection and correction? Calculate the Hamming distance between the following pairs of binary strings:  
 (i) 1011101 and 1001001      (ii) 11101 and 01111 4  
 ✓ A Hamming code is received as 1101010. Determine if there are any errors in the received code and, if so, correct the error. 4
4. a) Given a scenario where data packets are transmitted using Stop-and-Wait ARQ, by using the related sequence diagrams explain how the protocol handles the following:  
 (i) Lost data packet  
 (ii) Lost acknowledgement  
 (iii) Duplicate packet 3  
 b) In a Stop-and-Wait ARQ system, if the propagation delay between the sender and receiver is 50ms, and the time to send a packet is 10ms, calculate the utilization of the link. Assume that there are no errors and that the acknowledgement time is negligible. 4



- c) Discuss the hidden terminal and exposed terminal problems in wireless networks. How does the MACA protocol address these issues?
- d) A CSMA/CD network has a maximum propagation delay of 5 microseconds. What is the minimum frame size required to ensure collision detection? Assume the channel operates at 10 Mbps.

### Section-B

(Answer any 03(three) from the following questions)

1. a) The following is the content of a UDP header in hexadecimal format:

CB84000D001C001C

- (i) What is the destination port number?
  - (ii) Is the packet directed from a client to a server or vice versa?
  - (iii) What is the length of data?
- b) Define CIDR. A network on the internet has a subnet mask of 255.255.255.192. What is the maximum number of hosts it can handle? 2.5
- c) What function does TCP perform? Explain the steps in the TCP three-way handshake. 1+4
- d) Give two examples of computer applications for which connection-oriented service is appropriate. Also, give two examples of which connectionless service is best. 3

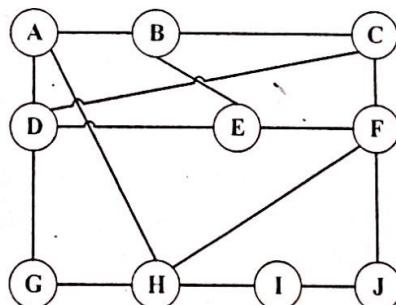
2. a) Define and differentiate the terms: datagram network and virtual-circuit network. 2+2

- b) The transport layer service is so similar to the network layer service, why are there two distinct layers? Why is one layer not adequate? Explain. 4

- c) How routing is possible within a datagram network? Explain with an example. 4

- d) What is NAT? How can NAT help address depletion? 3

3. a) From the following network of routers, *A* to *J*: Find the new routing table for router *H* by distance vector routing. The first four columns of the table show the delay vectors received from the neighbors of router *H*. Suppose that *H* has measured or estimated its delay to its neighbors, *A*, *F*, *G*, and *I*, as 10, 8, 9, and 6 msec, respectively. 6



| To | A  | F  | G  | I  |
|----|----|----|----|----|
| A  | 0  | 20 | 17 | 18 |
| B  | 5  | 25 | 27 | 24 |
| C  | 15 | 12 | 30 | 23 |
| D  | 8  | 14 | 7  | 27 |
| E  | 12 | 6  | 32 | 24 |
| F  | 18 | 0  | 21 | 17 |
| G  | 15 | 21 | 0  | 15 |
| H  | 10 | 11 | 8  | 7  |
| I  | 20 | 14 | 17 | 0  |
| J  | 25 | 9  | 22 | 5  |

- b) Differentiate between distance vector and link state routing algorithms. 3
- c) Discuss in detail the following two steps in link state routing: 3+3

- (i) Learning about the Neighbors. (ii) Building Link State Packets.

4. a) Briefly discuss the transport service primitives. 4

- b) What is Socket? Write the steps in TCP client-server socket creation. 5

- c) Write a brief note on the following terms: 3+3

- (i) Domain Name System (ii) World Wide Web

Hajee Mohammad Danesh Science and Technology University, Dinajpur  
Department of Computer Science and Engineering  
B.Sc. (Engineering) in CSE  
Semester Final Examination 2022 (Jul-Dec)  
Level 3 Semester II, Course Code: CSE 353, Credit: 3.0  
Course Title: Operating System

Time: 3 Hours

Marks: 90

Section A

Answer any Three

1. a) How an Operating System (OS) is initially loaded into a computer? Compare between multitasking and multiprocessing. 2+3  
b) What is system call? When is it needed? 2+3  
c) System programming is machine dependent or not; what do you think? How does shell manage interaction between user and OS? 2+3
2. a) Differentiate between a program and a process. Write the major events that causes process creation. 2+3  
b) There is no process hierarchy in Windows. What does this means? Draw the state diagram of a process states. 2+3  
c) Degree of multiprogramming depends on what? A computer system can hold five processes in its main memory. These programs are sitting idle waiting for I/O half of the time. Calculate CPU utilization. 2+3
3. a) What is Pthread? What is the main advantage of implementing threads in user space? 2+3  
b) Explain a method to achieve mutual exclusion. 5  
c) Schedule the following processes according to the shortest job first algorithm in a preemptive environment. Time quantum: 3. 5
4. a) Define swapping. How does memory compaction work? 2+3  
b) Explain optimal page replacement algorithm with an example. 5  
c) How does next fit algorithm manage free memory space? 5

| Process | Arrival Time | Time Required for Completion |
|---------|--------------|------------------------------|
| P1      | 1            | 7                            |
| P2      | 1            | 3                            |
| P3      | 1            | 5                            |
| P4      | 8            | 2                            |

## Section B

### Answer any Three

1. a) Write the advantages of applying segmentation. What information does the segment table hold for each segment? 2+3  
b) What are meant by logical address and physical address? 5  
c) Differentiate between segmentation and paging. 5
  
2. a) Write about any two file structures. 5  
b) Describe how to recover deadlock through rollback. 5  
c) Do starvation and deadlock mean the same? 5
  
3. a) What is transparency in distributed system? Explain. 5  
b) Differentiate between stateless and statefull services. 5  
c) Write about distributed system vs. computer network. 5
  
4. a) Write a short note on any two of the following: 7.5+
  - i. Kernel 7.5
  - ii. Thread
  - iii. Virtual Memory