

Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science and Engineering

4th Year 1st Semester B.Sc. Engineering Examination-2019

Course Code: CSE400

Course Title: Parallel Processing and Distributed Systems

Total Marks: 60

Time: 3 (Three) Hours

N.B.

i) Answer SIX questions out of the following EIGHT questions. ii) All questions are of equal values.

1. a) What are the necessities of replica in distributed system? 2
- b) Why is fragmentation of relation necessary? Explain vertical and horizontal fragmentation of relation with example. 4
- c) Describe Bully algorithm for selection of coordinator in distributed system. 4
2. a) What do you mean by loop carried dependency? Find out the data and loop dependency from the given code: 5

```
for(int i=1; i<n;i++)  
{  
    S1: a[i] = a[i-1] + b[i];  
    S2: c[i] = c[i] + d[i];  
}
```

Is it possible to make the loop parallel? If possible then apply an appropriate approach and make the loop parallel.
- b) We have a requirement for protecting the access of a SINGLE resource by multiple threads. Which semaphore technique you prefer to use for handling the requirement? Explain the technique with up and down process. 3
- c) What is cache coherency in shared variable model? For designing the Lock and Unlock routine which facilities you must have to ensure. 2
3. a) Suppose two different threads are running on shared memory model. Analyze the given threads and note what could go wrong? Find out the solution for parallel processing? 5

Thread 1	Thread 2
Shared A Shared A[1...2] Private i A[1]:= 0 For i:=1...N/2 A[1]:=A[1]+f(a[i]) A:=A[1]+A[2]	Shared A Shared A[1...2] Private i A[2]=0 For i=N/2+1...N A[2]:=A[2]+f(a[i])

- b) What do you mean by critical section? Why critical section finding is important? 2
- c) Write short note about Message Passing programming model. Explain the purpose of synchronization between sender and receiver to avoid deadlock situation in MPI. 3
4. a) Explain the scalar and vector processing step by step according to the following example: 5
DO I = 1, N
 A(I) = B(I) + C(I)
CONTINUE

b) Differentiate Instruction Level Parallelism, Thread Level Parallelism and Vector Data Parallelism. 3
c) What do you mean by 2-degree super scalar processor? Write some use of array processor. 2

5. a) What is PRAM Model? Explain the constraints that have been enforced on PRAM model. 5
- b) Suppose a task makes extrusive use of floating point operations with 30% of the time consumed by parallel operations with a new hardware design. If the floating point module is speeded up by factor 4. What is overall speedup? 3
- c) Explain VLSI Model with its application. How large is Very Large? 2
6. a) Find whether the transactions of the given table are serial or parallel? What do you know about Lock-S and Lock-X? Explain the situation that will be occurring when the following transaction is run? 5

T1	T2
Lock-X(A) Read(A) $A := A + 100$ Write(A) Lock-X(B)	Lock-S(B) Read(B) Lock-S(A)

- b) Cryptography is a fundamental technique within any distributed systems security environment. Explain the cryptography technique with its application. 3
- c) Explain data inconsistency in distributed system with an example. 2
7. a) Suppose a customer has raised complain about using debit card to withdraw money from Agrani Bank ATM. The ATM machine gives a money receipt of 10000 taka transaction, but no money is provided by the machine. Explain the technical problems of the transaction failure and the protocol that is used to recover the system. 5
- b) Write down the structural similarities between HDFS and GFS. 3
- c) 'Security in Distributed System is difficult to get right, impossible to get perfect' - Give your comment about this quote. 2
8. a) Is pipeline fully parallel process? Justify your answer. 2
- b) Distinguish between linear and non-linear pipelines. 4
- c) Suppose a linear pipeline of 5 stages can process thousand tasks. Calculate the pipeline efficiency and throughput with the clock cycle 0.5 sec. 4

Bangabandhu Sheikh Mujibur Rahman Science & Technology

Department of Computer Science and Engineering

4 th Year 1 st Semester Final B.Sc. Engineering Examination-2019

Course Code: CSE403

Course Title: Computer Simulation and Modeling

Total Marks: 60

Time: 3 Hour

Answer any Six questions out of the following EIGHT questions.

1. (a) What is model? Write down different types of model. 3
(b) Write down the four major differences between Discrete and Continuous System. 2
(c) What is Queuing System? Write down about the simulation of Queuing Systems. 1+4

2. (a) Briefly discuss about the selection of simulation software. 3
(b) What are the three measures of the system performance in a single server queuing system? 2
(c) What is Poisson Distribution? A computer repair person is "beeped" each time there is a call for service. The number of beeps per hour is known to occur in accordance with a Poisson distribution with a mean $\alpha = 2$ per hour. Determine probability of three beeps in the next hour. 1+4

3. (a) Define 'state variables'? In a single sever, what are the 'state variables' and 'events'? 2
(b) Life of an inspection device is given by X , a continuous random variable with 3
$$f(x) = \begin{cases} \frac{1}{2} e^{-x/2}, & x \geq 0 \\ 0, & \text{otherwise} \end{cases}$$
 pdf
Probability that the device's life is between 2 and 3 years.
(c) What is Bernoulli Trial and Distribution? What is Normal Distribution? 1+1
Derive the normal distribution equation and explain why we use it? +3

4. (a) Briefly explain about multiple service times and service mechanism for multiple servers. 2+3
(b) Write short notes on: 5
 - i. Linear Congruential Generators
 - ii. Mixed Generators

5. (a) Write down about the Generation of Pseudo-Random Numbers. 2
(b) Why Distributed lag model and cobweb models are used? 3
(c) What is Kolmogorov-Smirnov Test? Suppose 5 generated numbers are 0.44, 0.81, 0.14, 0.05, 0.93. Here $\alpha = 0.05$. Now test the data with Kolmogorov-Smirnov Test. 5

6. (a) What is input analysis? Write down the significance of Input analysis. 3
 (b) Briefly explain the scaled down model and mathematical model. 4
 (c) The data collected for 100 broken-widget repair times are

<i>i</i>	Interval (Hours)	Frequency	Relative Frequency	Cumulative Frequency, <i>c_i</i>	Slope, <i>a_i</i>
1	$0.25 \leq x \leq 0.5$	31	0.31	0.31	0.81
2	$0.5 \leq x \leq 1.0$	10	0.10	0.41	5.0
3	$1.0 \leq x \leq 1.5$	25	0.25	0.66	2.0
4	$1.5 \leq x \leq 2.0$	34	0.34	1.00	1.47

Now find out Random-Variate Generation X_1, X_2 , and X_3 .

7. (a) What is Discrete Distribution? What is Verification and Validation of Simulation Models? 5
 (b) What is Chi-square test? Give some dummy data and then test the data with Chi-square test. 5
 8. (a) Simulation run for 100 customers in a Grocery. 3

Customer	Simulation System				Performance Measure			
	Interarrival Time [Minutes]	Arrival Time [Clock]	Service Time [Minutes]	Time Service Begins [Clock]	Time Service Ends [Clock]	Waiting Time in Queue [Minutes]	Time Customer in System [Minutes]	Idle Time of Server [Minutes]
1	-	0	4	0	4	0	4	0
2	1	1	2	4	6	3	5	0
3	1	2	5	6	11	4	9	0
4	6	8	4	11	15	3	7	0
5	3	11	1	15	16	4	5	0
6	7	18	5	18	23	0	5	2
100	5	415	2	418	418	1	3	0
Total	415		317			174	491	101

Now find Average waiting time, Probability that a customer has to wait, Proportion of server idle time, Average time between arrivals and Average waiting time of those who wait.

- (b) What is Output analysis? Write down the significance of Output analysis. 2+2
 Write down the application of simulation and modeling. +3

Course Title: Digital Signal Processing

Course Code: CSE 410

Full Marks: 60

Time: 3(Three) Hours

N.B. i) Answer **SIX** questions from **EIGHT** questions.

ii) All questions are of equal values.

- | | | |
|---------|--|---|
| Q.1 (a) | State, with justifications, some major advantages and disadvantages of digital signal processing compared with the analog signal processing system. | 3 |
| (b) | Define system. When a system is said to be stable or not? Write down the benefits and applications of system analysis. | 3 |
| (c) | Test whether the following are memory systems are not and explain. | 4 |
| i. | $y(t) = x(t) + x(t + 1)$ | |
| ii. | $y(t) = tx(t)$ | |
| iii. | $y(n) = nu(n)$ | |
| iv. | $y(n) = u(n)$ | |
| Q.2 (a) | Explain in detail unit step function, unit ramp function, unit impulse function and unit parabolic function. | 3 |
| (b) | What is the difference between functional representation and tabular representation of a signal? Sketch the continuous time signal $x(t) = 10\sin \pi t$ for an interval $0 \leq t \leq 2$. Plot the corresponding discrete-time signal with a sampling period $T=0.2s$. | 5 |
| (c) | Differentiate between periodic and aperiodic signal. | 2 |
| Q.3 (a) | In what condition, a signal is called even or odd signal? Show that the product of two even signals or two odd signals is an even signal and the product of an even signal and an odd signal is an odd signal. | 4 |
| (b) | Find the odd and even components of the following signal: | 3 |

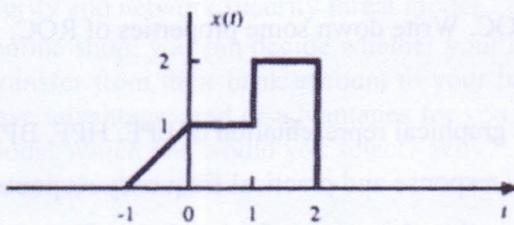


Figure-1

- | | | |
|---------|---|---|
| (c) | Find $(3t+5)$ and $(2t+4)$ for the signal of Figure-1. | 3 |
| Q.4 (a) | What is the difference between impulse response and impulse sequence? Determine the convolution sum of two sequences. $x(n)=\{1,2,3,4\}$; $h(n)=\{1,1,1,1\}$ by using matrix method. | 4 |
| (b) | Express the given signal sequence as a time -shifted impulse. | 3 |

$$x(n) = \{2, 3, 0, 7, 8, -15, 18, 20\}$$

- (c) Determine the input signal $x(n)$ that will generate the output sequence $y(n)=\{1, 5, 10, 11, 8, 4, 1\}$ for a system with impulse response $h(n)=\{1, 2, 1\}$
- Q.5 (a) Find the Fourier coefficients of the given signal
- $$x(t) = 1 + \sin 2\omega_0 t + 2\cos 2\omega_0 t + \cos(3\omega_0 t + \frac{\pi}{3})$$
- (b) What is meant by Fourier representation and why is it used? Determine the periodic signal whose fundamental frequency is 3π and Fourier coefficients are $a_0=1$, $a_{-1}=$
 $a_1 = \frac{1}{4}$, $a_{-3} = a_3 = \frac{1}{6}$, $a_{-5}=a_5 = \frac{1}{8}$, $a_{-7} = a_7 = \frac{1}{11}$
- (c) What are the basic differences exist between Fourier series and Fourier transform? Briefly explain the concept of Dirichlet condition.
- Q.6 (a) What is the significance of linear convolution and Z-transform?
- (b) State the properties of continuous time Fourier transform.
- (c) Perform circular convolution of the given data sequences using circle method.
 i. $x_1(n) = \{1, 3, 5, 7, 8, 9\}$ and $x_2(n) = \{1, 5, 7\}$
 ii. $x_1(n) = \{1, -1, -2, 2\}$ and $x_2(n) = \{1, 1, 1, 1\}$
- Q.7 (a) Determine the Z-transform of the signal and find the ROC.
- i. $x(n) = a^n u(n)$
 ii. $x(n) = -a^n u(-n-1)$
- (b) Find the inverse z-transform of the given function,
- $$x(z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$$
- (c) Define ROC. Write down some properties of ROC.
- Q.8 (a) Show the graphical representation of LPF, HPF, BPF and BSF in both the case of ideal frequency response and practical frequency response.
- (b) Write down the advantages of using digital filter. Differentiate between recursive and non-recursive filter.
- (c) Find the 8 point DFT and IDFT for the given data sequence $x(n)=\{1, 2, 3, 4\}$.

Course Title: Web Engineering

Full Marks: 60

N.B.

i) Answer SIX questions, taking any EIGHT.

ii) All questions are of equal values.

Course Code: CSE 430

Time: 3(Three) Hours

- Q.1 (a) What is agile development? Why is agility needed for web engineering? 2
(b) What are the challenges of deploying an E-Commerce business in Bangladesh? 3
(c) There are four types of customer named Industrials, Entrepreneur, Organizations and Academicians in a Web application platform. They will have insert information while logging in such as organization Id and so on. They can also perform all the actions like checkout, process and business deal. 5

Now you have to design use case diagram, logical and physical design paradigm for the system.

- Q.2 (a) To give an exam, an instructor first notifies the students of the exam date and the material to be covered. She then prepares the exam paper (with sample solutions), gets it copied to produce enough copies for the class, and hands it out to students on the designated time and location. The students write their answers to exam questions and hand in their papers to the instructor. The instructor then gives the exam papers to the TAs, along with sample solutions to each question, and gets them to mark it. She then records all marks and returns the papers to the students. 4

Draw a *sequence diagram* that represents this process. Make sure to show when each actor is participating in the process. Also, show the operation that is carried out during each interaction, and what its arguments are.

- (b) Describe the procedure to establish an SSL connection between browser and server. 4
(c) What are the characteristics of good information architecture? 2

- Q.3 (a) What are the analogies between operating system and web browser? 2
(b) Difference between web security and network security threat model. 2
(c) If you are the owner of an online shop, you can decide whether your customers have to pay after delivery by a money transfer from their bank account to your bank account or with a credit card. Both variants have advantages and disadvantages for you. Assume that you can select only one of both methods. Which one would you select? Why? 4
(d) How do we represent task interdependencies? 2

- Q.4 (a) What is E-Commerce? How does it differentiate from traditional business models? 1.5+2.5
(b) How a typical e-cash system works in E-Commerce? 2
(c) Describe different tools for WebE modeling? Write down the specific design goal when you are going to design a social networking site in which you can add friends, send message to your friends and create group for particular purpose. 4

- Q.5 (a) Write some design goals for a web app development. 2
- (b) Draw and explain Web Application design pyramid. Why design pyramid is essential for 4 designing Web Application.
- (c) What are the options available to store session token? 1
- (d) Write short notes on :- 1.5+1.5
- 1) Samy Worm attack
 - 2) Session hijacking

- Q.6 (a) What is a cookie? Why does google.com use cookie? 1+2
- (b) Can a coffee shop monitor my HTTPS traffic over their network? 2
- (c) Give a **State diagram** that describes the lifetime of a video tape in a video store. You can 5 assume that a video tape is purchased, packaged properly (plastic case with identification information on the outside), put in the video store database, and is then put up for rental. Customer who choose to rent it, check it out and return it in 3 days. If a customer fails to return it, the store calls him/her the next day. The call is repeated a second time after 2 more days, and if the tape is not returned within 2 more days, the store delegates the matter to a collection agency and removes the video tape from its collection. If the tape is damaged on return, it is removed from the collection database also. Finally, if the tape is missing during the annual store inventory, it is removed from the collection database as well.

Make sure to define events, conditions, actions for transitions in your diagram, where appropriate.

- Q.7 (a) Write down the appropriate way to assess quality of Web Application. 2
- (b) Is analysis modeling required for every increment? Explain input and output of analysis 2+2 modeling.
- (c) How does SQL Injection attack occur? Explain with example. Describe the worst scenario 4 of SQL injection attack.

- Q.8 (a) What is Web Application? Write down the attribute and categories of Web Application. 3
- (b) How team building is happening when you are planning to develop an E-Commerce based 3 electronic shop.
- (c) Why it is important to introduce framework in developing Web Application? 4