

Bangabandhu Sheikh Mujibur Rahman Science and Technology University

Department of Computer Science and Engineering

3rd Year 2nd Semester B.Sc. Engineering Examination-2021

Course Code: CSE357

Total Marks: 60

Course Title: Microprocessor and Microcontroller

Time: 3 (Three) Hours

N.B.

- 1) Answer **SIX** questions taking any **THREE** from each section.
- 2) The figures in the right margin indicate full marks.
- 3) All parts of a question (a, b, c, ...) must be answered sequentially.

SECTION - A

1. a) What are the functions of microprocessors? Differentiate microprocessor and microcontroller. 3
b) Draw block diagram of 8086 microprocessor. 4
c) Explain different addressing modes with examples. 3
2. a) What do you mean by 8-bit and 16 bit microprocessor? 3
b) Describe the general purpose registers 4
c) What happens when the microprocessor is powered up? 3
3. a) What is the Flag register? Discuss the role of five flag registers in an ALU operation using an example. 4
b) Draw pin diagram of 8086 microcomputer system overview and explain how data is transferred with in the 8086 microcomputer system. 3
c) What is memory segmentation? How different memory segments are accessed in 8086 microprocessor? 3
4. a) Give the main tasks of AX and IP registers for 8086 μ -processor. 4
b) Find the memory address of the next instruction executed by the μ -processor, when operated in the real mode, for the following CS:IP -
i) CS= 2301 Hand IP= 75FDH ii) CS= 3476H and IP= 1A00H
c) Why we need to initialize data segment? 3

SECTION - B

5. a) What is interrupt? Discuss maskable and non maskable interrupt. 3
b) Distinguishes between Logical address and Physical address. 3
c) Write short notes on following terms:
i) LEA
ii) MOY
iii) PUSH
iv) POP 4
6. a) Explain synchronous and asynchronous data transfer. 2
b) Draw and discuss block diagrams of microcontrollers. 4
c) How do you use a microcontroller to design a project traffic signal control? 4
7. a) Sub AX, BX, where AX contains 8000h and BX contains 0001h and calculate Status flag, Parity flag, Zero flag, Carry flag and Overflow flag. 3
b) Draw the block diagram of 8051 microcontroller and describe the components of the hardware. 4
c) What do you mean by .Stack 100h in assembly language? 3
8. a) Write pseudo-code divide -1250 by 7 3
b) Describe the general format of 16 bit MOV machine instruction with explanation of each component. 4
c) Describe how following instructions works in 8086 microprocessor-
i) ADD
ii) SUB
iii) MUL
iv) DIV 3

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3rd Year 2nd Semester B.Sc. Engineering Examination-2021

Course Code: CSE355

Total Marks: 60

Course Title: Numerical methods for Engineers

Time: 3 (Three) Hours

N.B.

- 1) Answer **SIX** questions taking any **THREE** from each section.
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- 3) All parts of a question (a, b, c, ...) must be answered sequentially.

SECTION - A

1. a) Derive using graphical depiction, the formula of false-position method. Accordingly, explain which shortcoming of bisection method is overcome by false-position method. 4
b) Determine the root of $x^{3.5} = 80$ using the false-position method within $\epsilon_s = 2.5\%$. Use initial guesses of 2.0 and 5.0. 4
c) Differentiate between truncation error and round-off error. 2
2. a) What are the differences between an open method and a bracketing method? Which method is suitable in what situation? Explain it with help of appropriate examples. 4
b) Apply Newton-Raphson method to find out root of the equation $x^3 + 5x - 3 = 0$ with a trial value is $x_0 = 0.6$. (Approximate to four decimal places) 6
3. a) Solve the following system of equations using Gauss elimination with partial pivoting. Show detailed calculation steps. 5

$$-3x_2 + 7x_3 = 2$$

$$x_1 + 2x_2 - x_3 = 3$$

$$5x_1 - 2x_2 = 2$$

- b) Solve the same system of equations given in 3(a) but use the Gauss-Seidel methods. Iterate the process until the approximate error falls below a stopping criterion of $\epsilon_s = 10\%$. 5
4. a) What is meant by least square regression? Derive the equations of the two constants (say, k_0 and k_1) used by the least square regression criterion. 4
b) Find the curve of best fit $y = ae^{bx}$ to the following data by using method of least square. 6

x	1	5	7	9	12
y	10	15	12	15	21

SECTION - B

5. a) The following data gives the melting point of an alloy of lead and zinc, where $t^{\circ}c$ is the temperature and p is the percentage of lead in the alloy 5

p	40	50	60	70	80	90
$t^{\circ}c$	184	204	226	250	276	304

Use Newton's backward interpolation formula to find the melting point of the alloy containing 84% of lead.

- b) Find a cubic polynomial which takes the following set of values (0,1), (1,2) (2,1), and (3,10). 5
6. a) Consider the following integral: 8

$$\int (y^2 - (y - 2)) dy$$

Now evaluate the integral from $y = 0$ to $y = 2$ using

- (i) Trapezoidal rule
- (ii) Multiple application trapezoidal rule, with $n = 4$. Also compute the true error.
- (iii) Simpson's 1/3 rule with $n = 4$. Also compute the true error.

- b) What is the main difference between a numerical method and a classical method in solving an engineering problem? 2

7. a) Consider the following integral:

$$\int_1^2 \left(x + \frac{1}{x}\right)^2 dx$$

Evaluate this using h^6 order Romberg integration.

4

- b) Derive the high accuracy differentiation formula for the forward and backward finite difference approximation of the first derivative.

8. a) Estimate the first derivative of the function $f(x) = 0.1x^4 + 0.25x^3 - 0.55x^2 + 0.4x + 3$ at $x = 0.5$ by (i) the high accuracy forward difference formula using the step-size of 0.5
(ii) Richardson extrapolation method with the high accuracy forward difference formula using the step-sizes of 0.5 and 1.0.
- b) Evaluate the following double integral using single application of Simpson's 1/3 rule $n=2$.

4

$$\int_0^1 \int_0^2 e^{x+y} dx dy$$

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3rd Year 2nd Semester B.Sc. Engineering Examination-2021

Course Code: CSE351

Total Marks: 60

Course Title: Computer Graphics

Time: 3 (Three) Hours

N.B.

- 1) Answer SIX questions taking any THREE from each section.
- 2) The figures in the right margin indicate full marks.
- 3) All parts of a question (a, b, c, ...) must be answered sequentially.

SECTION-A

1. a) Define Computer graphics. What is pixel? 3
b) What is DDA? What are the disadvantages of DDA algorithm? 4
c) "Lookup table reduces the storage requirement of an image." - Justify this. 3
2. a) Digitize a line from (10, 12) to (15, 15) on a raster screen using midpoint line drawing 3
b) Calculate the pixel location approximating the first octant of a circle having center at (4,5) and radius 4 units using Bresenham's algorithm 5
c) "Unequal brightness in one of the major adverse side effect of scan conversion." - Justify this. 2
3. a) Explain in detail about two dimensional viewing. 3
b) Perform a 45° degree 2D rotation of triangle X (3, 4), Y (2, 6), Z (8, 7) about the pivot point $P(2, 2)$. 4
c) Define 2D mirror reflection. Write the matrix form of reflection when an object is reflected with respect to X-axis. 3
4. a) Why is a polygon clipping needed? 3
b) Define Reflection. What are the types of Clipping? 3
c) Why midpoint algorithm is preferred over Cohen Sutherland algorithm? 4

SECTION-B

5. a) Define Window. Define view port. 3
b) Differentiate parallel projection from perspective projection. 3
c) Write short notes on Bezier curve and spline. 4
6. a) Describe the 3D translation and 3D rotation transformations. 4
b) Explain the following two anomalies for the perspective projection. 3
i) Vanishing points ii) Topological distortion.
c) Write the difference between vector and raster graphics? 3
7. a) Translate the polygon with co-ordinates A (2, 5), B (7, 10) and C (10, 2) by 3 units in x direction and 4 units in y direction. 5
b) Explain parallel projection with its types. 3
c) Define perspective foreshortening and vanishing points. 2
8. a) Define fractal? What is a Fractal Dimension? Give an example of fractals. 3
b) Write application of fractal in computer graphics. 3
c) What are the hardware devices used for computer graphics? What are the raster and vector graphics? 4

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3rd Year 2nd Semester B.Sc. Engineering Examination-2021

Course Code: CSE353

Total Marks: 60

Course Title: Computer Networks

Time: 3 (Three) Hours

N.B.

- 1) Answer SIX questions taking any THREE from each section.
- 2) The figures in the right margin indicate full marks.
- 3) All parts of a question (a, b, c, ...) must be answered sequentially.

SECTION-A

1. a) What is Framing? Why flag bits with bit stuffing is better method framing than flag bytes with byte stuffing? 4
b) Sender sends 011011101 and receiver receives 011011100 where one bit error is occurred. Describe how hamming code detect and correct above error. 3
c) Describe the functions of the data link layer. 3
2. a) Mention and describe the design issues for the layers of computer network model. Draw the OSI model. 5
b) What are the differences between Public and Private Address? 3
c) How TCP connection Establish and close? 2
3. a) Distinguish between TCP and UDP. 3
b) With necessary figure explain how connection is established and connection is released in TCP. 4
c) How does TCP achieve reliability? Discuss three way handshake for establishing and terminating a connection. 4
4. a) How collision handled with the CSMA/CD? 4
b) Show the hierarchy of switching techniques. What is the basic difference between circuit switching and packet switching? 3
c) What is network? Write short note on following types of networks-
i) PAN ii) WAN iii) MAN. 3

SECTION-B

5. a) What is error detecting code? Describe Checksum error detecting code. 3.5
b) What is the chief advantage of CIDR scheme of IP addressing? 3
b) What are the drawbacks of flooding and distance vector routing? How link state routing overcome the drawbacks. 3.5
6. a) What are the differences between datagram network and virtual circuit network? 2
b) Explain distance vector routing algorithm. Compute Routing table of node A for the following network. 4
c) What is count-to-infinity problem? Explain with example. 2
d) Define broadcast, multicast and unicast. 2
7. a) Explain hop by hop backpressure technique of congestion control. 3
b) What is NAT? What is the application of NAT. 4
c) Write down the differences among hub, switch and router. 3
8. a) What is the basic difference between BOOTP and DHCP? Define Telnet. 3
b) What do you mean by WWW, DNS and SMTP? 3
c) Define URL. Explain the four things of URL. 4

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3rd Year 2nd Semester B.Sc. Engineering Examination-2021

Course Code: CSE359

Total Marks: 60

Course Title: Software Engineering

Time: 3 (Three) Hours

N.B.

- 1) Answer SIX questions taking any THREE from each section.
- 2) The figures in the right margin indicate full marks.
- 3) All parts of a question (a, b, c, ...) must be answered sequentially.

SECTION – A (30 Marks)

- | | | |
|--|--|---|
| 1. | a) Define software engineering. What are the benefits of incremental development model over waterfall model? | 4 |
| b) Describe the difference between plan-driven and agile approaches with a diagram. What are the advantages and drawbacks of agile approaches? | 4 | |
| c) Write a short note on "Ishikawa Diagram". | 2 | |
| 2. | a) Describe each of the following terms:
i. Scrum
ii. JRP
iii. Unit testing | 4 |
| b) Describe factory design pattern with proper examples. | 2 | |
| c) What are the attributes of a good software? | 4 | |
| 3. | a) Briefly describe the fact finding methods.
b) A book is written by an author, published by a publisher, sold by a bookstore, and read by a reader. Moreover, for a reader to read a book, she must buy it from a book store that is selling it.
Draw a Use Case diagram for this scenario, showing relationships between different use cases.
c) Describe multiplicity notations in class diagram. | 2 |
| 4. | a) To buy a book electronically from chapters. com, a customer needs to select the book from a list provided by Chapter's eCommerce system, provide credit card information to the system, then the system gets authorization from the bank for the payment, and --if positive -- confirms the sale. The order is then sent to the orders department and when the book becomes available, it is shipped to the customer. Also, the order department charges the customer's credit card by informing the bank of the amount.
Draw a Sequence diagram that models this process. Make sure to model all relevant actors and the interactions between them. Do show explicitly the time intervals when different actors actively participate in the process you are modeling.
b) In terms of use-case modeling, define the "extends" relationship with an example.
c) Suppose you are writing a 'Stack' class. Design some test cases to verify your code. | 5 |

SECTION – B (30 Marks)

- | | | |
|----|---|---|
| 5. | a) Draw an Activity diagram that represents the making of a cup of tea. The initial three activities are Fill kettle with water, Find cup and Find tea bag and they may be performed in parallel. When the Find cup and Find tea bag are completed the activity Place tea bag in cup can start. The kettle must have boiled and the tea bag must have been placed in the cup before the activity Add water to cup can begin. If milk is required then activity Add milk should be performed.
b) Represent a library management system using layered architectural and client server architectural patterns with necessary justifications.
c) Describe the agile manifesto. | 4 |
|----|---|---|

6. a) Bangladesh Shipping Management (BSM) prides itself on having up-to-date information on the processing and current locations of each shipped item. To do this, BSM relies on a company-wide information system. Shipped items are the heart of the BSM product tracking information system. Shipped items may be of two types, goods and food. They can be characterized by item number (unique), weight, dimensions, insurance amount, destination, and final delivery date. Shipped items are received into the BSM system at a single retail center. Shipped items make their way to their destination via one or more standard BSM transportation events (i.e. flights, truck deliveries). These transportation events are characterized by a unique schedule Number, a type (e.g., flight, truck), and a delivery Route.
- Design a **Class diagram** to implement the scenario described above. 3
- b) Why is it that many software developers don't pay enough attention to requirements engineering? Are there ever circumstances where you can skip it? 2
- c) What is the difference between verification and validation? 2
7. a) A software has to be developed for automating the manual railway seat reservation system. The system should be distributed in nature. There are three types of users in the system (i) Passenger (i) Reservation staff is responsible for reserving or canceling seats (ii) administrator manages updating train information.
Assume the other functionalities of the proposed system and draw a **use case diagram** for it. 3
- b) Construct a DFD for the system stated in question 7(a). 4
- c) Discuss white-box testing in brief. What are the advantages and disadvantages of white-box testing? 3
8. a) Write down the five steps of test driven development. Demonstrate all the steps sequentially with the help of an example. 4
- b) Which of the following (i) and (ii) is a valid implementation of **Singleton Pattern**? Give specific reasons for each of the following implementations. 3
- (i)
- ```
public class Singleton {
 private static Singleton s_singleton = new Singleton();
 private Singleton() {}
 private static Singleton getInstance() {
 return s_singleton;
 }
}
```
- (ii)
- ```
public class Singleton {
    private Singleton() {}
    private static class SingletonHolder {
        private static final Singleton instance = new Singleton();
    }
    public static Singleton getInstance() {
        return SingletonHolder.instance;
    }
}
```
- c) Define alpha, beta, and acceptance testing. 3