Bangabandhu Sheikh Mujibur Rahman Science and Technology University
Department of Computer Science and Engineering
3rd Year 2nd Semester B.Sc. Engineering Examination-2020

Course Code: CSE353 **Course Title:** Computer Network
Full Marks: 60 **Time:** 3 Hours

N.B.: (i) Answer **six** questions taking any **three** from each section
(ii) All questions are of equal values

Section-A

1.	(a)	Describe OSI Reference Model.	5
	(b)	What are the differences between Public and Private Address?	2
	(c)	How TCP connection Establish and close?	3
2.	(a)	Distinguish between TCP and UDP.	2
	(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
3.	(a)	What do you know about public IP address and private IP address? Write down the ranges of class A, class B and class C private IP addresses.	2
	(b)	Suppose BSMRSTU has a range of IP addresses 200.200.0.0/16. You have to create at least 15 usable subnets so that each subnet contains as many addresses as possible. Answer the following: (i) What is the class of given IP block? (ii) How many usable subnets will be created? (iii) How many usable IP addresses will be there in each subnet? (iv) What will be the subnet mask of the fourth subnet? (v) What will be the second usable IP address of the second usable subnet?	5
	(c)	A datagram of 3000 bytes(20B+2980B ip payload) reached at router and must be forward to link MTU of 500 bytes .How many fragments will be generated and also write MF, offset, total length value for all.	3
4.	(a)	How does the IPv6 addressing differ from IPv4?	3
	(b)	Why is fragmentation needed in internet? Justify that ultimate destination is responsible for reassembling of fragments.	4
	(c)	What is the chief advantage of CIDR scheme of IP addressing?	3

Section-B

5.	(a)	What are the advantage of subnetting?	2
	(b)	Suppose a network with IP Address 192.16.0.0. is divided into 2 subnets, find number of hosts per subnet. Also for the first and second subnet, find- Subnet Address First Host ID Last Host ID Broadcast Address Limited Broadcast Address	5
	(c)	If the subnet mask 255.255.255.128 belongs to class C, find- Number of subnets Number of hosts in each subnet	3

6. (a) What are the functions of internet probing tools <ping> and <tarceout>? 2

(b) How collision handled with the CSMA/CD? 3

(c) Explain error detection technique in data link layer. A bit stream 1101011011 is transmitted using the standard CRC method. The generator polynomial is x4+x+1. What is the actual bit string transmitted? 5

7. (a) Schematically shows how does the ARP message send? 3

(b) Show the graphical coding examples of NRZ, Manchester and NRZI for the following bits: 0 0 1 0 1 1 1 1 0 1 0 0 0 0 1 0 3

(c) Perform 2D parity checker for error detection for the following data: 1100111 1011101 0111001 0101001 4

8. (a) Write down the difference between congestion control and flow control. 2

(b) How congestion is controlled by Datagram Subnet? 4

(c) Describe two application layer protocols. 4

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Course Code: CSE351 **Course Title:** Computer Graphics
Full Marks: 60 **Time:** 3 Hours

N.B.: (i) Answer **six** questions taking any **three** from each section
(ii) All questions are of equal values

Section-A

1. (a) What are the main roles of computer graphics in computer application? 2
   (b) What are major application areas of computer graphics? Explain. 4
   (c) "Lookup table reduces the storage requirement of an image." – justify this. 2
   (d) If we use 2-byte pixel values in a 24-bit lookup table representation, how many bits does the lookup table occupy? 2

2. (a) Indicate which raster locations would be chosen by Bresenham's algorithm when scan-converting a line from pixel coordinate (3,1) to pixel coordinate (8,7). 5
   (b) "Unequal brightness in one of the major adverse side effect of scan conversion." – justify this. 2
   (c) Draw up to the fourth-order C curve. 3

3. (a) Define 2D mirror reflection. Write the matrix form of reflection when an object is reflected with respect to X-axis. 2
   (b) Perform a 45^0 degree 2D rotation of triangle ***X (3,4), Y (2, 6), ZC (8, 7)*** about the pivot point ***P(2,2)***. 4
   (c) Magnify the triangle in 2-D with vertices ***A (0, 0), B (2, 2), C (8, 9)*** to twice its size while keeping ***C (8, 9)*** fixed. 4

4. (a) Why is a polygon clipping needed? 2
   (b) Compare between convex and concave polygon with necessary figure. 2
   (c) Why midpoint algorithm is preferred over Cohen Sutherland algorithm? 2
   (d) Use the Weiler-Atherton algorithm to clip the polygon in Fig. 4.1. 4

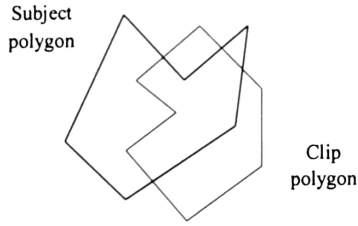

Fig. 4.1: Polygons.

Section-B

5. (a) Briefly explain the orthographic projection. 3.5
   (b) Define perspective foreshortening, vanishing points and depth cueing. 3
   (c) Describe the 3D translation and 3D rotation transformations. 3.5

6. (a) "To project an image, engineers and drafters use parallel projection." – justify this. 2
   (b) Explain the following two anomalies for the perspective projection. 3
   Vanishing points ii. Topological distortion
   (c) The unit cube (**See Fig. 6.1**) is projected onto the xy plane. Draw the projected image using the standard perspective transformation with d = 2, where d is the distance from the view plane. 5

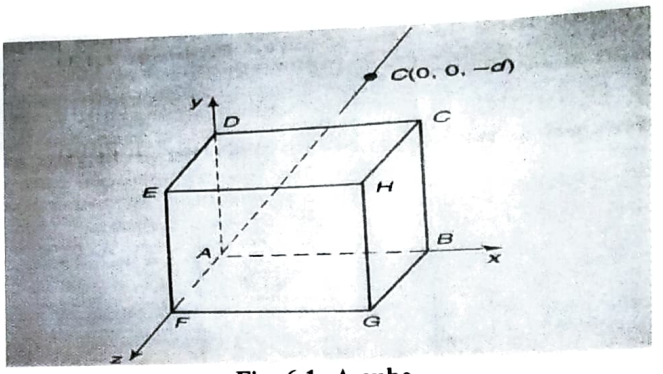

Fig. 6.1: A cube.

7. (a) Compare between polylines, polygons and planar polygons. 2

   (b) What is the Wireframe model? Explain three different representations of this model. 5

   (c) Show that the n-the degree B-spline basis functions $B_{i,n}(x)$ satisfy – 3
   $B_{i,n}(x) = 0$ if $x < t_i$ or $x > t_{i+n+1}$

8. (a) Illustrate the painter's algorithm to determine the visible surface in 3-D computer graphics. 6

   (b) Given points P1(2,5,8), P2(3,6,18) and P3(2,4,6) and a viewpoint C(0,-5,2), determine which points obscure the others when viewed form C. 4

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Course Code: CSE355 **Course Title:** Numerical Methods for Engineers
Full Marks: 60 **Time:** 3 Hours

N.B.: (i) Answer **six** questions taking any **three** from each section
(ii) All questions are of equal values

Section-A

1. (a) Use zero- through fourth-order Taylor series expansions to predict $f(2.5)$ for $f(x) = \ln x$ using a base point at $x = 1$. Compute the true percent relative error ε_t for each approximation. 6
   (b) Explain accuracy and precision. 2
   (c) Differentiate between chopping error and round-off error. Which one is better and why? 2

2. (a) If *f(x)* is real and continuous in the interval x_1 to x_2, then what should be the condition that there can be at least one real root between x_1 and x_2 to this function? Explain the reason. 3
   (b) Determine the root of $f(x) = -26 + 85x - 91x^2 + 44x^3 - 8x^4 + x^5$ using the bisection method. Employ initial guesses of $x_l = 0.5$ and $x_u = 1.0$. Iterate the process until the approximate error falls below a stopping criterion of $\varepsilon_s = 10\%$. Note that you must show the detail calculation of the first iteration. 4
   (c) Discuss the pitfall of false-position method and its solution. 3

3. (a) Prove that the Newton-Raphson method has quadratic convergence property. 4
   (b) Derive the Newton-Raphson formula for finding the roots of equations. Find a root of the equation $xsinx + cosx = 0$ using the Newton-Raphson method. Carry out the computation for three iterations, and use four significant figures in your computation. 4
   (c) What are the problems associated with the naive Gauss elimination algorithm? 2

4. (a) Determine a root of $f(x) = x^5 - 16.05x^4 + 88.75x^3 - 192.0375x^2 + 116.35x + 31.6875$ using modified secant method with an initial guess of $x = 0.5825$, $\delta = 0.05$ and $\varepsilon_s = 0.01\%$. 5
   (b) The upward velocity of a rocket is given at three different times. 5

Time, t (s)	Velocity, v (ms^{-1})
5	50
8	65
12	90

The velocity data is approximated by a polynomial as: $v(t) = a_1t^2 + a_2t + a_3$
Find the velocity at $t = 6$, 9 and 11 seconds.

Section-B

5. (a) Use the Gauss-Seidel method to solve the following system until the percent relative error falls below $\varepsilon_s = 5\%$, 4

$$10x_1 + 2x_2 - x_3 = 27$$
$$-3x_1 - 6x_2 + 2x_3 = -61.5$$
$$x_1 + x_2 + 5x_3 = -21.5$$

   (b) Mention two pitfalls of Gauss Elimination method and the solution for those pitfalls. 3
   (c) Briefly explain the LU decomposition. 3

6. (a) Fit a second-order polynomial to the provided data using the least-squares regression principle. 7

x	0	1	2	3	4	5
y	2.1	7.7	13.6	27.2	40.9	61.1

Compute the correlation coefficient of determination.

(b) State the formulas for Lagrange interpolating polynomials. 3

7. (a) Fit a second-order Newton's interpolating polynomial to estimate log (10) using the data: 5

$x_0 = 8$, $\log(x_0) = 0.9030900$

$x_1 = 9$, $\log(x_1) = 0.9542425$

$x_2 = 11$, $\log(x_2) = 1.0413927$

Compute the true percent relative error. Note that the true value of log (10) = 1.

(b) Evaluate the following integral using multi-application trapezoidal rule with $n = 4$. 5

$$\int_0^3 (1 - e^{-2x})dx$$

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 6

(ii) Richardson extrapolation method with the high accuracy forward difference formula using the step-sizes of 0.5 and 1.0.

(b) How does Runge-Kutta (RK) methods achieve the accuracy of a Taylor series approach without requiring the calculation of higher derivatives? Show how you can obtain different second-order methods for different values of parameter a_2. 4

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Course Code: CSE357 **Course Title:** Microprocessor and Microcontroller
Full Marks: 60 **Time:** 3 Hours

N.B.: (i) Answer **six** questions taking any **three** from each section
(ii) All questions are of equal values

Section-A

1. (a) What do you mean by 8-bit and 16 bit microprocessor? 2
   (b) Describe the general purpose registers. 4
   (c) What happens when the PC is powered up? 4

2. (a) Give the main tasks of AX and IP registers for 8086 μ-processor. 2
   (b) What is the purpose of the FLAGS register? 2
   (c) Find the memory address of the next instruction executed by the μ-processor, when operated in the real mode, for the following CS:IP - 4
   CS = 2301H and IP = 75FDH ii. CS = 3476H and IP = 1A00H
   (d) What is the difference between serial ports and parallel ports? 2

3. (a) Draw the pin configuration of 8086 microprocessor. 4
   (b) Distinguishes between Logical address and Physical address. 4
   (c) Why we need to initialize data segment? 2

4. (a) Depicts the Intel 8086 Microprocessor Organization. 4
   (b) Describe the following pin: 4
   ALE, NMI, INTR, TEST
   (c) What do you mean by .Stack 100h in assembly language? 2

Section-B

5. (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. 4
   (b) Write pseudo-code divide -1250 by 7. (using IDIV) 3
   (c) Why flag is used in microprocessor? Differentiate between status and control flag. 3

6. (a) Suppose AL contains 11001011b and CF=1. Give the new contents of AL after each of the following instruction is executed. Assume the preceding initial conditions for each part of this question. 6
   i. SHL AL,1
   ii. SHR AL,1
   iii. ROR AL, CL if CL contains 2
   iv. SAR AL, CL if CL contains 2
   (b) Write short notes on following terms: 4
   i. LEA
   ii. MOV
   iii. PUSH
   iv. POP

7. (a) Write pseudo-code by using ROL to count the number of 1 bits In BX, without changing BX. Put the answer In AX. 4

(b) Suppose that AX= 1234h, BX= 5678h, CX = 9ABCh, and SP=100h. Give the contents of AX, BX, CX, and SP after executing the following instructions: 4

```
PUSH AX
PUSH BX
XCHG AX,CX
POP AX
PUSH AX
POP BX
```

(c) Write instruction to do the following task: Read a character and display it at the next position on the same line. 2

8. (a) Discuss how the left shift instructions can be used to multiply the content of a register by m, where $m=2^n$ and n is a positive integer. 4

(b) Discuss how the rotate instructions can be used to count the number of 1 bit in a register without changing the content of that register. 4

(c) What is the use of the LOCK bar signal of the 8086 μ-processor? 2

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Course Code: CSE359 **Course Title:** Software Engineering
Full Marks: 60 **Time:** 3 Hours

N.B.: (i) Answer **six** questions taking any **three** from each section
(ii) All questions are of equal values

Section-A

1. (a) What is the aim of software engineering? Illustrate with a diagram that the software does not wear out. 1+3
   (b) How are software myths affecting software process? Explain with the help of examples. 3
   (c) What do you understand by the term SDLC? Why is it important to adhere to a life cycle model while developing a large software product? 1+2

2. (a) Discuss about waterfall model and iterative model of software development. 4
   (b) How Ishikawa diagram is used to identify, explore and depict problems, and the causes and the effects of those problems? Describe with an appropriate example. 3
   (c) Compare incremental and spiral model for software development process. 3

3. (a) Briefly describe the fact finding methods. 5
   (b) As a part of ensuring eGovernance goal, the Government is going to computerize its land management process that keeps records about land ownership and transfers of ownerships. It is your responsibility to do the requirement analysis for such a project. What fact finding techniques you may use and how? 3
   (c) What is JRP? 2

4. (a) A car-insurance company maintains data about the following entities: (i) customers: id, name, phone, email, address; (ii) cars: license, model, year; (iii) accidents: report number, date, and location. 3
   Construct an E-R diagram for the car-insurance company whose customers own one or more cars each. Each car has associated with it zero to any number of recorded accidents.
   (b) There are two types of users in the system described in the above scenario (i) Data entry operators who are responsible for managing all entities (ii) administrator manages user accounts only. 3
   Draw a use case diagram for the system stated as above.
   (c) Construct a DFD for the system stated in the question (a) and (b). 4

Section-B

5. (a) Describe the risk management process of a system. 5
   (b) Consider, you have a collection of several hundred music CDs. Your friends love to borrow them, often borrowing several at the same time. You don't mind lending the CDs, but it is becoming difficult for you to keep track of which friend borrowed which CD. The difficulty is increased by the fact that you have more than one copy of some CDs. Also, you are thinking of introducing a daily fee per CD loaned. For these reasons, you would like to build a database, which you could query to find out how many CDs a given friend has; how long the friend has had them and how much he or she owes; who has a particular CD and so on. Draw **class diagram** for the above scenario. 5

6. (a) What do you know about COCOMO model? Describe the basic COCOMO model with its limitations. How COCOMO II model for cost estimation can be used at various stages of a project lifecycle? 4

(b) Briefly explain the purpose of each of the sections in a software project plan. 4

(c) What is the difference between a software process model and a software process? 2

7. (a) What are software size metrics? How is function point metric advantageous over LOC metric? 3

(b) Suppose you are the project manager of a newly founded software firm and you are estimating the cost of a customized VOIP software to quote in a tender process. The market is very competitive, but you have the advantage of having some skilled persons in your firm. What pricing factors you should consider while making that cost estimation and why? 3

(c) Describe the following software cost estimation techniques: 4
(i) Parkinson's Law.
(ii) Pricing to win.

8. (a) Discuss white-box testing in brief. What are the advantages and disadvantages of white-box testing? 3

(b) What is the difference between verification and validation? What input and output faults you may check while designing a banking transaction module. 4

(c) Discuss Integration, Beta, and Usability testing in brief. 3