B. Sc (HONS) IN CSE, PART-II, THIRD SEMESTER EXAMINATION, 2019

[According to the New Syllabus]

(Subject Code : 520201)

(Data Structure)

Time—3 hours

Full marks—80

[N.B. The figures in the right margin indicate full marks. Answer any **four** *questions.]*

			Marks
1.	(a)	Define data structure. Describe some data structure operations.	1+4=5
	(b)	Briefly explain different types of data structures with examples.	5
	(c)	What do you mean by the term algorithm, complexity of an algorithm and time-space trade-off of an algorithm?	5
	(d)	Find the complexity of linear search algorithm for— *(i)* Best case *(ii)* Average case and *(iii)* Worst case	5
2.	(a)	Discuss various string operations with example.	5
	(b)	Let S="His father is the professor"; find out the result of the following operations : *(i)* Substring (S,11,5); *(ii)* Index (S, 'ESS'); *(iii)* Insert ('ABAABB', 3, 'BC'); *(iv)* Delete (S, 14, 4); *(v)* Replace (S, 'IS', 'ER'). [Consider S in upper case].	5
	(c)	Write down the first pattern matching algorithm.	5
	(d)	Find the table and corresponding graph for the pattern P=aaaba, using second pattern matching algorithm.	5
3.	(a)	Write an algorithm to sort a linear array using Bubble Sort algorithm.	5
	(b)	Suppose the following sorted 10 elements are sorted in an array A. A : 10, 12, 14, 16, 18, 20, 21, 22, 23, 25 Now apply the binary search algorithm to the array A for item = 21.	6
	(c)	Write down the difference between array and records.	4
	(d)	What is recursion? Write a recursive procedure that gives a solution to the Tower of Hanoi problem for N disks.	1+4=5

[Please turn over

Marks

4. *(a)* What is Linked List? Write an algorithm that inserts an ITEM into a linked list. 1+4=5

(b) Consider the following queue of characters, where QUEUE is a circular array which is allocated six memory cells— 5

FRONT-2, REAR-4, QUEUE :—A, C, D, —, —

Describe the queue as the following operations take place :

(i) F is added to the queue

(ii) Two letters are deleted

(iii) K, L. M are added to the queue

(iv) Two letters are deleted

(v) R is added to the queue.

(c) What is garbage collection? Describe overflow and underflow situation in case of stack and queue. 1+4=5

(d) Write a procedure that pushes an ITEM onto a stack. 5

5. *(a)* Define tree. How can trees be represented in memory? 1+4=5

(b) Describe the three ways of traversing a binary tree. 6

(c) Define heap. Build a max-heap, H from the following list of data : 5, 44, 30, 50, 22, 60, 55, 77, 55. 1+4=5

(d) Differentiate between complete and extended binary trees. 4

6. *(a)* What is graph? Write an algorithm to find the shortest path in a graph. 1+5=6

(b) Briefly describe adjacency matrix and path matrix. 2+2=4

(c) Apply Huffman algorithm and draw the decode tree for the following data items : 5

Data item	A	B	C	D	E	F	G	H
Weight	22	5	11	19	2	11	25	5

(d) Briefly explain two-way and header linked list. 5

B.Sc (HONS.) IN CSE, PART-II, THIRD SEMESTER EXAMINATION, 2019

Object Oriented Programming

[According to the New Syllabus]

Subject Code : 520203

Time—3 hours

Full marks—80

[N.B. The figures in the right margin indicate full marks. Answer any **four** *questions.]*

			Marks
1.	(a)	What do you mean by object oriented programming? Describe the main features of object oriented programming.	5
	(b)	Distinguish between class and object with example.	5
	(c)	Explain the data types of C++.	5
	(d)	What are the area of application of OOP technology?	5
2.	(a)	What is inline function? Mention some situation where inline function may not work.	4
	(b)	"Forward declaration is needed in case of using friend function"—Justify your answer with a suitable program.	6
	(c)	Write down the differences between constructor and destructor function.	4
	(d)	Write a simple C++ program to show the use of constructor.	6
3.	(a)	What do you mean by operator overloading? Write a C++ program to overload the binary operators to perform all arithmetic operating.	2+6=8
	(b)	Write down the differences between member operator function and friend operator function.	6
	(c)	What are the implications of the following two statements ?	6
		(i) Class A : Private B { 11.....}	
		(ii) Class A : Public C, Private B { 11.....}	

[Please turn over

Marks

4. (a) What is Inheritance? Describe different forms of inheritance with figure. 6

(b) What is virtual base class? When do we make a class virtual? 4

(c) Create an abstract base class called shape. Derive class rectangle from the base class shape and a class cube from the rectangle class. 10

Data members : Length, width for class rectangle.
Height for class cube.

Member function :

area ( ), print ( ) for class rectangle.

Volume ( ), print ( ) for class cube.

Make function print ( ) as virtual and declare as a pure virtual function in the base class. Write a main program to compute the area at rectangle and volume of cube and display the result using base class pointer.

5. (a) What is 'this' pointer? What are the application of 'this' pointer? 1+4=5

(b) What do you mean by virtual function? How does a virtual function help to achieve polymorphism? 2+3=5

(c) What is a file mode? Describe the various file modes available. 1+3=4

(d) Write a C++ program to copy the contents of a text file into another. 6

6. (a) What is a stream? Describe briefly the features of I/O system supported by C++. 1+5=6

(b) Differentiate between Java and C++. 4

(c) What is JVM? Why java is called the platform independent programming language? 1+3=4

(d) Write a Java program to take the temperature in centigrade as input and show the temperature in fahrenheit as output. (Use necessary packages). 6

B. Sc (HONS) IN CSE, PART-II, THIRD SEMESTER EXAMINATION, 2019

COMPUTER ARCHITECTURE

[According to the New Syllabus]

Subject Code: 520205

Time—3 hours

Full marks—80

[N.B. The figures in the right margin indicate full marks. Answer any **four** *questions.]*

			Marks
1.	(a)	Define computer architecture. Explain Von Neumann architecture with diagram.	7
	(b)	Explain the functional view of a computer.	7
	(c)	What is computer bus? Discuss in briefly the elements to design of compiter bus.	6
2.	(a)	Discuss the characteristics of RISC and CISC processors.	6
	(b)	Discuss the relative merits of the central switch and bus architecture.	6
	(c)	Define addressing mode. Describe with examples relative and register addressing mode.	8
3.	(a)	What is instruction? How many types of instructions are there? Discuss briefly.	7
	(b)	What is pipe line processing? Explain pipe line processing with example.	8
	(c)	What is instruction cycle? Discuss the instruction cycle state diagram.	5
4.	(a)	What do you mean by hit ratio? Draw the four-level hierarchical memory system.	2+4=6
	(b)	The parameters of a computer memory system are specified as follows—	7
		Main memory size = 8 K blocks	
		Cache memory size = 512 blocks	
		Block size = 8 words	
		Determine the size of the tag field of the main memory address under the following conditions :	
		(i) Fully associative mapping	
		(ii) Direct mapping	
		(iii) Set associative mapping with 16 blocks/set.	
	(c)	What is memory mapping? Illustrate the direct mapping and set associative mapping.	7

[Please turn over

Marks

5. (a) Draw the flowchart of Booth's algorithm for two's complement multiplication. 7

(b) Draw the all possible cycles and explain its operation for the following division 8

$$(-7) \div (+3)$$

using Booth's algorithm of two's complement division.

(c) Design a 4 bit carry look ahead adder and describe its operation. 5

6. (a) What do you mean by I/O module? How is the peripheral connected to CPU? 5

(b) What is DMA? Explain the working principles of DMA controller. 2+4=6

(c) Define interrupt. Discuss different types of interrupts with examples. 4

(d) What is RAID? Explain the basic operation and advantageous of RAID. 5

B. Sc (HONS) IN CSE, PART-II, THIRD SEMESTER EXAMINATION, 2019

ORDINARY DIFFERENTIAL EQUATION

[According to the New Syllabus]

Subject Code : 520207

Time—3 hours

Full marks—80

[N.B. The figures in the right margin indicate full marks. Answer any **four** *questions.]*

Marks

1. (a) Define the terms Order and Degree of an ODE. Find the Order and Degree of the equation 4+2=6

$$\frac{d^2y}{dx^2} = K\left[1+\left(\frac{dy}{dx}\right)^2\right]^{\frac{5}{2}}.$$

(b) Show that $xdy + ydx = 0$ is the Differential Equation of the family of rectangular hyperbola $xy = c^2$. 4

(c) Solve the Differential Equations (any **two**) : 5×2=10

(i) $x\frac{dy}{dx} - 3y = x^2$

(ii) $(x + y - 1)\,dy = (x + y + 1)\,dx$

(iii) $\frac{dy}{dx} = y\tan x + y^3\tan x$

2. Solve any **five** of the following : 4×5=20

(i) $\sin^{-1}\left(\frac{dy}{dx}\right) = x + y$

(ii) $(xy + y^2)\,dx + (xy - x^2)\,dy = 0$

(iii) $\frac{dy}{dx} = \frac{x + 2y + 3}{2x + y + 3}$

(iv) $(x^2 + y^2 + x)\,dx + xydy = 0$

(v) $(1 + x^2)\frac{dy}{dx} + y = e^{\tan^{-1}x}$

(vi) $\frac{dy}{dx} = y\tan x + y^3\tan x$

[Please turn over

Marks

3. Solve (any **five**) : 4×5=20

(i) $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 0$, when $y(0) = 0$ and $y'(0) = 1$

(ii) $(D^2 - 6D + 9)\, y = 1 + x + x^2$

(iii) $(D^2 + 4) = \sin 2x \sin x$

(iv) $(D^3 - 3D^2 + 4)\, y = e^{3x}$

(v) $(D^3 - D^2 + 4D - 4)\, y = 68e^x \sin 2x$

(vi) $(D^2 - 1)y = x^2 \cos x$

4. (a) Define orthogonal and oblique trajectories. 4

(b) Find the orthogonal trajectories of the family curve $x^2 - y^2 = c_1^2$. 5

(c) Find the orthogonal trajectories of the family curve $r^n = c^n \cos n\theta$. 5

(d) The population of a city increases at a rate proportional to the present number. It has an initial population of 50,000 that increases by 15% in 10 years. What will be the population in 30 years? 6

5. (a) Solve the following Initial Value Problems (any **two**) : 6×2=12

(i) $2\frac{d^2y}{dx^2} - \frac{dy}{dx} - 3y = 0, y(0) = 2, y'(0) = -\frac{7}{2}$

(ii) $y'' + 4y = 0, y(0) = 2, y'(0) = 2\sqrt{2}$

(iii) $9y'' - 3y' - 2y = 0, y(0) = 3, y'(0) = 1$

(b) Use a suitable substitution to solve the ODE 8

$$x^3\frac{d^3y}{dx^3} + 3x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = x + \ln x.$$

6. (a) A mass of 1 slug stretches a spring 2ft and comes to rest at equilibrium. The system is attached to a dashpot that imparts a damping force equal to eight times the instaneous velocity of the mass. Find the equation of motion if an external force equal to $f(t) = 8\sin(4t)$ is applied to the system beginning at time $t = 0$. 8

What is the transient solution?

What is the steady state solution?

(b) Use the variation of parameters method to solve the ODE 12

$$\frac{d^2y}{dx^2} + 4y = 4\tan 2x.$$

B. Sc (HONS) IN CSE, PART-II, THIRD SEMESTER EXAMINATION, 2019

FUNDAMENTAL OF BUSINESS STUDIES

[According to the New Syllabus]

Subject Code : 520209

Time—3 hours

Full marks—80

[N.B. The figures in the right margin indicate full marks. Answer any **four** *questions.]*

			Marks
1.	(a)	Define Business. Write down the objectives of business.	6
	(b)	What are the differences between entrepreneur and entrepreneurship?	4
	(c)	Describe the different forms of business ownership in Bangladesh.	6
	(d)	Define product and write down its features.	4
2.	(a)	What is management?	4
	(b)	Discuss the functions of management.	6
	(c)	State the different types of business organizations.	6
	(d)	Write down the difference between marketing and distribution.	4
3.	(a)	What do you mean by personal finance? What are the types of personal finance?	6
	(b)	Write down the importance of financial management.	4
	(c)	Point out the basic differences between Risk management and Insurance management.	4
	(d)	What is promotion? Describe the different tools of promotion.	6
4.	(a)	What are the core functions of Marketing?	5
	(b)	Name and describe the four major steps of consumer driven marketing strategies.	5
	(c)	What are the elements of marketing mix?	5
	(d)	What are the importance of HRM?	5

[Please turn over

Marks

5. (a) What is Accounting? Why accounting is called the language of Business? 5

(b) Max started his own consulting firm, named Consult Max, on January 2019. During the first month of operation the following transactions occurred : 15

January 1 Max invested Tk. 10,000 in cash in the Business.
10 Paid Tk. 800 for the monthly rent.
15 Purchased office equipment on account Tk. 3,000.
19 Rendered consulting services to the clients for cash Tk. 1,500.
22 Borrowed Tk. 700 cash on a note payable.
25 Rendered consulting services to the clients on credit Tk. 2,000.
28 Paid monthly salary Tk. 500.
29 Paid monthly utilities Tk. 400.
30 Paid Tk. 1,000 for equipment purchased on January 15.
31 Cash received Tk. 1,000 for service rendered on January 25.
31 Max withdrew Tk. 200 from business for personal use.

(i) Prepare journal for the above transactions in the books of Consult Max.

(ii) Prepare ledger in the books of Consult Max from the Journal.

(iii) Prepare trial balance in the books of Consult Max as January 31, 2019.

6. (a) What are GAAP? Explain the accounting equation. 5

(b) What do you mean by special journal? Explain various special journals. 5

(c) The following transactions of Gullu Company regarding cash receipts for the month of December, 2018 : 10

December 1 Gullu makes cash investment of Tk. 48,000 in the business.
2 Cash sales for merchandise Tk. 29,000 (cost Tk. 24,000).
9 A cheque for Tk. 19,600 is received from Fida Company is payments of invoice no. 100 for Tk. 20,000 less 2% discount.
15 Cash sales of merchandise Tk. 25,000 (cost Tk. 16,000).
18 A cheque for Tk. 29,100 is received from Gokul Company for invoice no. 101 for Tk. 30,000 less 3% discount.
20 Cash received by signing a note for Tk. 10,000.
25 A cheque for Tk. 24,500 received from Kabul Company is full settlement for invoice no. 102 for Tk. 25,000 less 2% discount.
28 Cash sales Tk. 10,000 (cost Tk. 9,000).
31 Cash of Tk. 3,000 is received on interest earned for the month of December.

Journalise the instruction in the cash receipts Journal.