BANGLADESH TECHNICAL EDUCATION BOARD

Agargoan, Dhaka-1207.

4-YEAR DIPLOMA-IN-ENGINEERING PROGRAM

SYLLABUS (PROBIDHAN-2016)

COMPUTER TECHNOLOGY

TECHNOLOGY CODE: **666**

4th SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

COMPUTER TECHNOLOGY (666)

Sl. No.	Subject Code	Name of the Subject	T	P	C	Marks				
						Theory		Practical		Total
						Cont. Assess	Final Exam	Cont. Assess	Final Exam	
1	66641	Object Oriented Programming	2	3	3	40	60	25	25	150
2	66642	Data Structure & Algorithm	2	3	3	40	60	25	25	150
3	66643	Web Development	0	6	2	-	-	50	50	100
4	66644	Data Communication System	2	6	4	40	60	50	50	200
5	66645	Computer Peripherals	1	6	3	20	30	50	50	150
6	66842	Principle of Digital Electronics	3	3	4	60	90	25	25	200
7	65841	Business Organization & Communication	2	0	2	40	60	-	-	100
7										
Total			**12**	**27**	**21**	**240**	**360**	**225**	**225**	**1050**

66641	Object Oriented Programming	T	P	C
		2	3	3

OBJECTIVES

To develop knowledge and skill on Object Oriented Programming (OOP).
To develop knowledge and skill on C# language as OOP, it's syntax, keywords and programming.
To develop knowledge on the .Net Framework.

SHORT DESCRIPTION

Overview of C# Programming and The .net framework; Program structure and Basic syntax of C#; Data types, Variables, Constants and Literals of C#;Operators and expressions of C#; Decision making statements, Looping statements of C#; Arrays and strings; Methods; Classes and structures; Polymorphism; Inheritance; Interface and Delegates.

DETAIL DESCRIPTION

Theory:

1 Overview of C# programming and the .net framework
- 1.1 State Programming Features of C#
- 1.2 Overview the .NET Frameworks
- 1.3 Describe Common Language Runtime (CLR)
- 1.4 Explain Integrated Development Environment (IDE) for C#
- 1.5 Describe .NET Framework Class Library
- 1.6 Describe Common features of Object Oriented programming
- 1.7 Describe Comparison between C# and Java

2 Understand program structure and basic syntax of C#
- 2.1 Describe Program Structure of C#
- 2.2
- 2.3 Compile and Execute the C# Program
- 2.4 Uses of Input/output in C#
- 2.5 Explain the Variables in C#
- 2.6 Describe Namespaces
- 2.7 Define of C# Keywords

3 Understand data types, variables, constants and literals of C#
- 3.1 Describe Different kind of data types:
  Integer, Floating Point, Decimal, Characters & Strings, Boolean and Null able Types.
- 3.2 Define and Initialize Variables
- 3.3 Define constants

4 Understand operators and expressions of C#
- 4.1 Describe Arithmetic, Logical, Relational, Assignment, Bitwise and Miscellaneous Operators
- 4.2 Explain Operator Precedence
- 4.3 Define Checked and Unchecked Operators
- 4.4 Describe the Expressions of C#
- 4.5 Explain the Lvalue and Rvalue Expressions in C#

5 Understand decision making statements of C#
- 5.1 Explain if Statement
- 5.2 Explain if...else Statement
- 5.3 Describe The if...else if...else Statement
- 5.4 Explain Nested if Statements
- 5.5 Describe Switch Statement
- 5.6 Describe Conditional Operator

6 Understand looping statements of C#
- 6.1 Explain While Loop, For Loop, Do...While Loop and Nested Loops
- 6.2 Explain Loop Control Statements
- 6.3 Describe Infinite Loop

7 Understand arrays and strings
- 7.1 Declare and Initialize an Array
- 7.2 Explain Classifications of Arrays
- 7.3 Describe Jagged Arrays
- 7.4 Create a String Object
- 7.5 Describe the Properties of the String Class
- 7.6 Describe the Methods of String Class

8 Understand methods
- 8.1 Define Methods in C#
- 8.2 Explain the Calling Methods in C#
- 8.3 Describe the Calling of Recursive Method
- 8.4 Explain the method of passing Parameters to a Method
- 8.5 Explain the method of passing Parameters by Value
- 8.6 Explain the method of passing Parameters by Reference
- 8.7 Explain the method of passing Parameters by Output

9 Understand classes
- 9.1 Define C# Class
- 9.2 Explain Member Functions and Encapsulation
- 9.3 Mention the uses of Constructors and Destructors
- 9.4 Mention the uses of Static Members of a C# Class
- 9.5 Explain Class versus Structure

10 Understand polymorphism
- 10.1 Describe Polymorphism
- 10.2 Describe Types of Polymorphism
- 10.3 Explain Method overloading
- 10.4 Explain Operator Overloading

11 Understand inheritance
- 11.1 State Inheritance
- 11.2 Describe Base and Derived Classes
- 11.3 Describe Initialization of Base Class
- 11.4 Explain Single Inheritance
- 11.5 Describe Multilevel Inheritance
- 11.6 Explain Multiple Inheritance
- 11.6 Describe Hierarchical Inheritance

Practical: Perform skill to create, compile, debug & execute C# programs to solve specific problems.

1 Develop programs using basic structure of c# programming language

1.1 Prepare a C# program for printing a message.

1.2 Prepare a C# program for adding two integer numbers using Windows from.

2 Develop programs using different variable and operators

2.1 Prepare a C# program to swap two numbers

2.2 Prepare a C# Program to calculate Age in YY-MM-DD

2.3 Prepare a C# program that takes two numbers as input and returns true or false when both numbers are even or odd.

3 Practice programs using conditional statement exercises

3.1 Prepare a C# program to find the largest of three numbers.

3.2 Prepare a C# program to read mark of six subjects of a student and calculate the GPA according to BTEB Diploma in Engineering Probidhan 2016.

3.3 Prepare a C# program to check whether an alphabet is a vowel or consonant.

4 Exercise programs using loop exercises

4.1 Prepare a C# program to find the sum of first 10 natural numbers. (The first 10 natural number is : 1 2 3 4 5 6 7 8 9 10; The Sum is : 55)

4.2 Prepare a C# program to convert a decimal number to hexadecimal.

4.3 Prepare a C# program to calculate the factorial of a given number

4.4 Prepare a C# program to display first N prime numbers

4.5 Prepare a C# program to display the first N terms of Fibonacci series

5 Develop programs using arrays and strings

5.1 Prepare a C# program to store elements in an array and print it.

5.2 Prepare a C# program to find the sum of all elements of the array

5.3 Prepare a C# program to find maximum and minimum element in an array

5.4 Prepare a C# program to sort N numbers in ascending/descending order

5.5 Prepare a C# program to find the second largest element in an array

5.6 Prepare a C# program to separate the individual characters from a string.

5.7 Prepare a C# program to count a total number of alphabets, digits and special characters in a string

6 Practice programs using methods

6.1 Prepare a C# program to create a user define function.

6.2 Prepare a C# program to create a user define function with parameters

6.3 Prepare a C# program to create a function for the sum of two numbers

6.4 Prepare a C# program to create a function to swap the values of two integer numbers.

6.5 Prepare a C# program to create a recursive function to find the factorial of a given number.

7 Practice programs using classes and structures

7.1 Prepare a program for manipulating information of a student (Name, Roll, GPA) in using C# class.

7.2 Prepare a C# program using Constructor and destructor

7.3 Prepare a C# program using Structure.

8 Develop program using polymorphism

8.1 Prepare a C# program using function overloading.

8.2 Prepare a C# program using operator overloading.

9 Exercise programs using inheritance

9.1 Prepare a C# program using single inheritance.

9.2 Prepare a C# program using multilevel inheritance.

9.3 Prepare a C# program using multiple inheritances.

9.4 Prepare a C# program using hybrid inheritance.

10 Practice programs using interface and delegates

10.1 Prepare a simple program using C# Interface.

10.2 Prepare a simple program to implement delegate in C#.

Reference Books:

1. ***Programming in C# (3rd Edition) by E. Balagurusamy***
2. ***Head First C# by Andrew Stellman***
3. ***C# 5.0 in a Nutshell (5thEdition) by Ben Albahari, Joseph Albahari***

Online References:

1. https://www.tutorialspoint.com/csharp/index.htm
2. http://www.c-sharpcorner.com/beginners/
3. http://www.csharp-station.com/Tutorial.aspx/
4. http://stackoverflow.com/questions/294128/c-sharp-web-developmentlearning-strategy
5. http://www.sitepoint.com/vb-dot-net-c-sharp-programming/
6. http://www.csharp411.com/best-c-web-sites/
7. http://msdn.microsoft.com/en-us/library/67ef8sbd(v=vs.80).aspx
8. http://www.pgacon.com/csip21/default.htm
9. http://www.homeandlearn.co.uk/csharp/csharp.html

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66642 DATA STRUCTURE & ALGORITHM T P C
2 3 3

AIMS

• To provide the knowledge & skill on data structures.
• To provide the knowledge & skill on writing simple algorithms.
• To develop and test simple programs related to data structures.

SHORT DESCRIPTION

Data types, data structure and algorithm; Arrays, records, pointers and linked lists;
Stack, queue and recursion; Searching & sorting.

DETAIL DESCRIPTION

Theory:

1 Understand the idea of data structure.

1.1 Define data & information.
1.2 State data types.
1.3 Define Memory Location
1.4 Define data structure.
1.5 Mention Different types of data structure.
1.6 Describe different types of data operation.

2 Understand the basic concept of algorithm

2.1 State the characteristics of algorithm
2.2 Define the pseudo code & algorithmic notations.
2.3 Describe the structured programming and flowcharts.
2.4 Describe the Complexity of algorithm

3 Understand the concept of arrays, records and pointers.

3.1 Define linear array.
3.2 Write the algorithm for traversing linear arrays.
3.3 State the representation of linear array in Memory.
3.4 Write the algorithm for inserting and deleting elements into/from linear arrays.
3.5 Write the algorithm of matrix multiplication.
3.6 State the use of pointer arrays, Jagged array and records.

4 Understand the properties of the linked lists.

4.1 Define linked lists.
4.2 Describe the representation of linked lists in memory.
4.3 Write the algorithms to traverse a linked list.
4.4 Write the algorithms for searching a linked list.
4.5 Write the algorithms for inserting/deleting nodes into/from a linked list.

5. Understand the Operation of Stack

5.1 State the meaning of the terms PUSH, POP&LIFO.
5.2 Write the algorithm for adding or removing data into / from a Stack.
5.3 Describe the Polish and Reverse Polish Notation of arithmetic expression.
5.4 Describe the operation of Infix, Postfix & Prefix transformation.
5.5 Write the algorithms to transform Prefix expression into Prefix expression and vice versa.

6. Understand the Operation of Queue

6.1 Define Queue.
6.2 Describe Priority queues.
6.3 Mention differences between stack and queue
6.4 Write the algorithms for inserting/deleting data into/from queues.

7. Understand the Operation of Recursion.

7.1 Define Recursion
7.2 Explain the uses of recursive functions.
7.3 Write the algorithms to compute factorial N by recursive functions.
7.4 Explain Fibonacci number generation algorithm by recursive functions.

8 Understand the Operation of searching.

8.1 State the different techniques of searching.
8.2 Describe the linear and binary search algorithm.
8.3 Write the algorithms for linear & binary search.
8.4 Compare the complexity of linear & binary search algorithms.

9 Understand the Operation of sorting.

9.1 State the different techniques of Sorting.
9.2 Describe the technique of bubble sort, quick sort, heap sort, insertion sort, selection sort and merge sort.
9.3 Write the algorithms for bubble sort, quick sort, heap sort, insertion sort, selection sort and merge sort.
9.4 Compare the complexity of different sorting algorithms.

10 Understand the basics of Storing string

10.1 Define String
10.2 State the types of structures for storing strings.
10.3 Describe the Record – oriented, Fixed-Length storage procedure of strings.
10.4 State the advantages and disadvantages of record oriented, fixed-length storage.

Practical:

1. Develop and Test a program for data insertion & Deletion in a Linear Array.
2. Develop and Test a program for Multiplication of two Matrices
3. Develop and Test a program for inserting/Deleting nodes into/from a Linked List.
4. Develop and Test a program using PUSH and POP Operation in Stack.
5. Develop and Test a program to convert an infix expression to postfix expression.
6. Develop and Test a program for Data insertion and Deletion from a Queue.
7. Develop and Test a program for calculating factorial N and Fibonacci number using Recursion.
8. Develop and Test a program to find out data using linear search and binary search.
9. Develop and Test a program to arrange Data Ascending and Descending using Bubble Sort algorithm.
10. Develop and Test a program to arrange Data Ascending and Descending using Quick Sort algorithm.

REFERENCE BOOKS:

1. Data Structures
   BY- Seymour Lipchitz (Schaum's Outline Series)
2. Data Structure and Algorithm
   By- Md. Mokter Hossain
   Md. Masud Karim
   Md. Moynul Hoque

66643	Web Development	T	C	P
		0	6	2

Short Description:

This unit covers knowledge, skills and attitudes required to -

- Create and manage rich web content including jQuery plugins, images, CSS3 animation, audio and video within a website.
- To enter dynamic features for the Client Side Dynamic Web page using jQuery and check the completed website for accuracy using common browsers.
- get the benefits of reusability in design and development and understand how grid works and how to use them in mobile and responsive web design and development
- understand the design of single-page applications and how AngularJS facilitates their development and elegantly implement Ajax in AngularJS applications
- Properly separate the model, view, and controller layers of your application and implement them using AngularJS
- Gain the PHP programming skills needed to successfully build interactive, data-driven sites

1. Develop a Client Side Dynamic Webpage using jQuery

1.1. Follow OSH practices
- 1.1.1. Safe work practices are observed as according to workplace procedures.
- 1.1.2. OSH hazards and incidents are reported to appropriate personnel according to workplace procedures.
- 1.1.3. Turn on your PC properly.

1.2. 2. Plan the dynamic features to be added to a website to meet client requirements.
- 1.2.1. Plan the purpose and intended audience of the website are identified.
- 1.2.2. The design requirements and constraints are identified.
- 1.2.3. A conceptual design is developed.
- 1.2.4. Necessary software installed and checks other requirement.

1.3. Add jQuery to the website in accordance with the design specifications.
- 1.3.1. JQuery plugin is added and attributes are assigned to meet client requirements in terms of the layout and formatting of the pages and enhancements.
- 1.3.2. Interactivity is added, edited and formatted to the website in accordance with client requirements.
- 1.3.3. Dynamic content is added in each and every page, if required, in accordance with client requirements.
- 1.3.4. The website is saved to a file by use of the program tools available for the task.

1.4. Test the website.
- 1.4.1. The theme is tested to ensure compatibility, functionality, correct any errors and log in according to the testing procedures in the plan.
- 1.4.2. The theme is opened in a variety of common browsers and check for accessibility, readability, legibility and presentation in accordance with client requirements.
- 1.4.3. The theme is evaluated for fitness for purpose in terms of the purpose, target audience and specifications of client requirements.

2. Separate the model, view, and controller layers of an application (and implement them using AngularJS)

2.1. Introduction to AngularJS
- 2.1.1. Understand What AngularJS does
- 2.1.2. Understand Who controls AngularJS
- 2.1.3. Know How to get AngularJS

2.2. Create the first AngularJS application
- 2.2.1. Create a basic application
- 2.2.2. Use angular-seed
- 2.2.3. Understand the pieces of the puzzle
- 2.2.4. Observe how it fits together
- 2.2.5. Use Model, View, Controller from the AngularJS Perspective

2.3. Single Page Applications
- 2.3.1. Understand the Single Page Application
- 2.3.2. Creating Angular Modules
- 2.3.3. Use Angular's Routing Service

2.3.4. Create a Skeleton Single Page Application

2.4. Controllers

2.4.1. Find out where Controllers fit in, and what they do, from Angular's perspective

2.4.2. Manage Scope

2.4.3. Set up Behavior

2.4.4. Build a basic controller

2.4.5. Use advanced controller

2.5. Models

2.5.1. Create a model

2.5.2. Explicit models

2.5.3. Implicit models

2.6. Views

2.6.1. take on the View of AngularJS

2.6.2. Tie a View to a Controller

2.6.3. Tie a View to a model

2.7. Expressions

2.7.1. Understand Expressions that are lightweight code snippets

2.7.2. Find out Expression capabilities

2.7.3. Find the Limitations

2.7.4. Draw the border between expressions and $eval

2.8. Filters

2.8.1. Use standard filters

2.8.2. Write your own filter

2.8.3. Tie filters together

2.9. Scopes

2.9.1. Understand what scopes are

2.9.2. Find out what scopes can provide

2.9.3. Understand Scope lifecycle

2.9.4. Use Scopes as glue between controller and view

2.9.5. Understand Scope hierarchies

2.9.6. Understand Scope and events

2.10. Angular Forms

2.10.1. Find the difference between Angular forms vs HTML forms

2.10.2. Use Angular form controls

2.10.3. Use Form events

2.10.4. Use The form controller

2.10.5. Perform Form validation

2.11. Ajax, Data, and Angular

2.11.1. Understand High level interactions with servers

2.11.2. Understand Low-level server interactions with $http

2.11.3. Use The deferred/promises API

2.11.4. Make RESTful Service calls with $resource

2.12. Directives

2.12.1. Learn and apply HTML new tricks

2.12.2. Bind text and attributes

2.12.3. Use Directive for processing lifecycle

2.12.4. Use a basic directive

2.12.5. Find the difference between Directives and scopes

2.12.6. Create reusable directives

2.12.7. Turn directives into components

2.13. Testing in Angular

2.13.1. Perform unit testing

2.13.2. Perform End-to-end testing

3. Design and development of responsive web site (using open source framework, Bootstrap)

- 3.1. Bootstrap Scaffolding
  - 3.1.1. Mobile first design
  - 3.1.2. Understand why Bootstrap
  - 3.1.3. Include Bootstrap
  - 3.1.4. Customize installation
  - 3.1.5. Understand Responsive Design
  - 3.1.6. Use The "container" class
  - 3.1.7. Understand How Grids work in Bootstrap
    - 3.1.7.1. Use Grid classes (.col-xs-, .col-sm-, .col-md-, .col-lg-)
    - 3.1.7.2. Add offsets to columns
    - 3.1.7.3. Push and pull columns
    - 3.1.7.4. Use Nested columns
  - 3.1.8. Navigation components
    - 3.1.8.1. Use Navs
    - 3.1.8.2. Use Navbars
  - 3.1.9. Use Jumbotron component
- 3.2. Page Components
  - 3.2.1. Use Headers
  - 3.2.2. Use Panels
  - 3.2.3. Use ListGroup
  - 3.2.4. Use Breadcrumbs
  - 3.2.5. Use Labels
  - 3.2.6. Use Buttons
  - 3.2.7. Use Glyphicons (with buttons, toolbars and form inputs)
  - 3.2.8. Use Wells
- 3.3. Page Components: Forms
  - 3.3.1. Create forms
  - 3.3.2. Use Inline and horizontal forms
  - 3.3.3. Perform Form validation
- 3.4. Bootstrap Plugins
  - 3.4.1. Use Alert Messages
  - 3.4.2. Use Buttons and button groups
  - 3.4.3. Use ScrollSpy
  - 3.4.4. Use Tabs
  - 3.4.5. Use Collapse
  - 3.4.6. Use Carousel
  - 3.4.7. Use Modal
- 3.5. Extending Bootstrap with Custom Plugins
  - 3.5.1. Use Bootbox.js
  - 3.5.2. Use DateTime Picker
  - 3.5.3. Use Font Awesome
  - 3.5.4. Use Off-Canvas
  - 3.5.5. Use Image Gallery
  - 3.5.6. Use Social Buttons
  - 3.5.7. Use SweetAlert
  - 3.5.8. Use Yamm3 Mega Menu
- 3.6. Review and More Practice
  - 3.6.1. Review the Bootstrap CSS source code
  - 3.6.2. Build another Bootstrap web page from scratch

4. Develop website using PHP and MySQL (Basic Level)

- 4.1. Introduction to web development with PHP
  - 4.1.1. Understand The architecture of a web application
  - 4.1.2. Find out how to edit and test a PHP application
- 4.2. How to code a PHP application
  - 4.2.1. Apply Basic PHP skills
  - 4.2.2. Code the control statements
  - 4.2.3. Use the PHP documentation
- 4.3. Introduction to relational databases and MySQL
  - 4.3.1. Understand the Relational Databases
  - 4.3.2. Use the SQL statements for data manipulation
  - 4.3.3. Understand MySQL
  - 4.3.4. Use phpMyAdmin
- 4.4. Use PHP with a MySQL database
  - 4.4.1. Use MySQL with the help of PHP
  - 4.4.2. Get data from a result set
  - 4.4.3. Develop a Product Viewer application
  - 4.4.4. Develop Product Manager application
- 4.5. Test and debug a PHP application
  - 4.5.1. Test and debug a PHP application
- 4.6. work with form data
  - 4.6.1. Get data from a form
  - 4.6.2. Display data on a web page
- 4.7. Use code control statements
  - 4.7.1. Use code for conditional expressions
  - 4.7.2. Use code for selection structures
  - 4.7.3. Use iteration structures
- 4.8. work with strings and numbers
  - 4.8.1. Use strings
  - 4.8.2. Use numbers
  - 4.8.3. Develop skills for working with strings and numbers
- 4.9. work with dates
  - 4.9.1. Use timestamps to work with dates
  - 4.9.2. Use objects to work with dates
- 4.10. create and use arrays
  - 4.10.1. Create and use an array
  - 4.10.2. Create and use an associative array
  - 4.10.3. Use functions to work with arrays
  - 4.10.4. Work with arrays of arrays
- 4.11. Work with cookies and sessions
  - 4.11.1. Use cookies
  - 4.11.2. Apply sessions
- 4.12. How to create and use functions
  - 4.12.1. Develop basic skills for working with functions
  - 4.12.2. Create and use a library of functions
  - 4.12.3. Use functions
- 4.13. How to use regular expressions, handle exceptions, and validate data
  - 4.13.1. Use regular expressions
  - 4.13.2. Handle exceptions
- 4.14. Review and Practice
  - 4.14.1. Review all the developed code and application
  - 4.14.2. Practice for further skill development on PHP & MySql

66644	DATA COMMUNICATION SYSTEM	T	P	C
		2	6	4

AIMS

- To be able to acquire the knowledge on data communication Basics.
- To be able to provide the knowledge and to develop skill on signal and data transmission systems and transmission media.
- To be able to acquire the knowledge on Digital communication and computer networks.
- To be able to provide the knowledge and to develop skill on network topologies and protocols.
- To be able to provide the knowledge and to develop skill on MODEM, Hub, Switch, NIC and Repeater.
- To be able to establish and implement a LAN to provide Network services.

SHORT DESCRIPTION

Communication Basics; Analog and Digital Modulation and Demodulation; Analog and Digital communication; Transmission media and connectors; LAN, Network fundamentals; Peer-peer & Client-Server techniques; Topologies and protocols; NIC; Network Addressing; IP address and Subnet Mask.

DETAILS DESCRIPTION

Theory:

1. Understand the communication basics.

1.1 Define Electronic Communication.

1.2 Mention the basic elements of a communication system.

1.3 Describe communication system with a simple block diagram.

1.4 State the terms: Frequency, Wavelength, Spectrum, Bandwidth, Throughput, Propagation speed, Propagation time, Noise figure & SNR

1.5 Mention the difference between bandwidth and data rate.

1.6 Describe simplex, half-duplex and full duplex modes of communication.

1.7 Describe synchronous and asynchronous communication techniques.

2. Understand Analog Communication Systems

2.1 Define Modulation and Demodulation.

2.2 State the necessity of modulation.

2.3 Mention the types of modulation.

2.4 Describe Amplitude, Frequency and Phase modulation with necessary waveform.

2.5 State the difference between analog and digital modulation

2.6 State the advantage and disadvantages of ASK, FSK and PSK (BPSK)

3. Understand Digital Communication Systems

3.1 Define digital modulation.

3.2 Describe Digital communication system with block diagram.

3.3 Define Line Coding and Block Coding.

3.4 Mention the Line Coding Schemes.

3.5 State unipolar Line coding with timing diagram.

3.6 Describe NRZ-I Line Coding scheme using 4B/5B Block Coding.

3.7 Describe different types of polar encoding with necessary timing diagram.

4. Understand the transmission media and connectors.

4.1 Mention the categories of transmission media

4.2 Describe the construction of Twisted-pair (STP, UTP) Co-axial and Fiber optic cable.

4.3 State the characteristics of Twisted-pair (STP, UTP), Co-axial and Fiber optic cable.

4.4 State the advantage and disadvantages of each type of cables.

4.5 Define Wireless Media and Propagation.

4.6 Describe Wireless Propagation Modes with diagram.

4.7 Describe the method of Radio, Microwave and Infrared communication system.

4.8 State the characteristics of Radio, Microwave and Satellite communication system.

5. Understand multiplexing techniques

5.1 Define Multiplexing and De-multiplexing process of communication system.

5.2 State the necessity of multiplexing.

5.3 Mention the categories of multiplexing.

5.4 Define Frequency division multiplexing.

5.5 Describe Frequency division multiplexing and de-multiplexing technique with block diagram

5.6 Describe the Wave division multiplexing and De-multiplexing technique with block diagram

5.7 Define Time division multiplexing and of Code division multiplexing system

5.8 State difference between baseband and broadband transmission.

6. Understand computer network basics.

6.1 Define Computer Network

6.2 State the concept of computer Network.

6.3 Mention elements of computer network.

6.4 Describe the advantages of Computer network.

6.5 Describe the application of computer network.

6.6 Describe client / server and peer-to-peer network.

6.7 Describe the general features of LAN, MANs and WANs.

7. Understand the network topologies.

7.1 Define network topology.

7.2 Mention the difference between physical and logical topology.

7.3 Describe the physical connection of bus, ring, star, mesh and hybrid topologies.

7.4 Mention the advantages and disadvantages of bus, ring, star, mesh and hybrid topologies.

7.5 Describe the factors to select a particular topology.

7.6 Describe the logical topologies of a token ring network.

8. Understand network protocols.

8.1 Define network protocol.

8.2 Describe the main elements of protocol.

8.3 Describe the characteristics of protocol.

8.4 Describe the functions of protocol.

8.5 List different types of network protocols.

8.6 State the function of TCP/IP protocol.

9. Understand IP addressing.

9.1 Define Network Addressing.

9.2 Define IP and IPv4

9.3 Describe the IP address formats of class A,B,C,D &E with example.

9.4 Describe subnet and subnet masks.

9.5 State CIDR format of subnet.

9.6 Define IPv6.

9.7 Describe the address format of IPv6.

10. Understand Network Interface Cards (NIC)

10.1 State the role of NIC.

10.2 Describe the format of Physical address (MAC Address) of NIC.

10.3 Mention the points that agree both the sending and receiving NICs.

10.4 State the importance of base memory address for NIC.

10.5 Mention the important points to maintain the compatibility among NIC, bus and cables.

10.6 Describe the NIC related factors that enhanced the performance of network.

11. Understand the connectivity devices

11.1 List the connectivity devices used in networking.

11.2 Describe function of MODEM.

11.3 Describe MODEM types and Standard.

11.4 Describe the features of ADSL and Digital MODEM.

11.5 Describe the functions of Hubs, Repeaters and switches in network.

11.6 Describe the important features of Repeaters and switches.

11.7 Describe the functions of Router and Gateway

Practical:

- **Identify different types of guided communication media.**

1. Twisted Pair Cable- Unshielded Twisted Pair (UTP), Shielded Twisted Pair (STP)
2. Co-axial Cable- Thick net and Thin net
3. Fiber Optic Cable- Single mode and Multi mode
4. Constructional features of UTP, STP, Co-axial Cable and Fiber Optic Cable.

- **Identify different types of connectors**

5. Twisted Pair Cable- RJ45 Connectors and their constructional features.
6. Co-axial Cable- BNC Connectors and their constructional features.
7. Fiber Optic Cable- MT-RJ and their constructional features.

- **Identify other Network hardware's**

8. Network Interface Cards/LAN cards/ Network Adaptor.
9. Cable Tester, Crimper and Accessories
10. Modems, Hubs, Repeater, Switch & Router

- **Connect RJ45 Connector with UTP Cable**

11. Make a straight through cable
12. Make a Cross over cable
13. Make a console cable

- **Establish a Peer to Peer/Workgroup LAN**

14. Install Network Interface Card (NIC) into the PC
15. Check the MAC address of the Network Interface Card (NIC)
16. Connect straight cable or cross over cable among PCs, Hub or Switch
17. Configure the TCP/IP in each PC
18. Test the connectivity among PCs using Ping Command.

- **Perform the task to Work with a Peer/Workgroup LAN environment for simple data communication.**

19. Share the folders, Pen drive and Secondary memory.
20. Share a printer, DVD Drive or any other resources.

- **Establish a Client–Server Local Area Network**

21. Install Windows server 2012 into a server PC
22. Configure TCP/IP to server and client PCs
23. Perform the task to configure the Active Directory
24. Perform the task to configure The DNS.
25. Perform the task to configure the DHCP
26. Perform the task to Work with a Client–Server LAN environment for simple data communication and Administrative functions.

REFERENCE BOOKS

1. Data communications and Networking – Behrouz A. Forouzan.
2. Fundamentals of Communication-M. Shamim Kaiser and associates
4. Data and Computer Communications-William Stallings
5. Local Area Networking – S. K Basandra.
6. MCSE Windows & Networking Essential – Joe Casad

66645	COMPUTER PERIPHERALS	T	P	C
		1	6	3

AIMS

- To be able to interface and maintain Key-board, Mouse, Monitor, Printer etc. along with the computer system.
- To be able to develop the knowledge & skills regarding working construction and interfacing aspects of peripherals.
- To be able to acquire the knowledge and skills on working principle & operation of peripheral devices.

SHORT DESCRIPTION

Peripheral interface and peripherals; Input-Output devices; Display devices; Special I/O devices; disk drives.

DETAIL DESCRIPTION

Theory:

1. Understand the basics of interfacing.

1.1 Define peripheral and interfacing with example.
1.2 State the functions and necessity of interfacing.
1.3 State the Categories of interface.
1.4 Mention the methods of peripheral interfacing.
1.5 State the steps of analog and digital interfacing in a computer system.
1.6 State the elements of interface.
1.7 Describe the function of a general purpose parallel interface with block diagram.

2. Understand the operation of serial interfaces.

2.1 State the necessity of serial interfacing.
2.2 Mention the asynchronous character and synchronous block data format for a serial interface.
2.3 Describe the operation of an USART with block diagram.
2.4 Describe the operation of RS 232.C/v.24 standard serial interface with block diagram.

3 **Understand the operation of keyboard and mouse.**

3.1 Describe the construction and operation of mechanical, membrane, capacitive and Hall effect key switches.
3.2 State the terms: bouncing, de-bouncing, n-key rollover and n-key lockout.
3.3 State the function of Keyboard Encoder.
3.4 Describe the working principle of an optical and wireless mouse.

4 Understand the basic operation of displays and adapters.

4.1 Classify the display devices.
4.2 Describe the working principle of LCD and LED display unit using Block diagram.
4.3 State the meaning of the terms-pixel, scanning, Horizontal and Vertical scanning, interlace and non-interlace scanning.
4.4 Describe the general structure of a modern video display adapter/ graphics adapter.
4.5 Prepare the specification of a LCD and LED monitor.

5 Understand the constructional and operational feature of dot matrix printers.

5.1 Classify printers (dot-matrix, Inkjet, Laser)
5.2 State the feature of a dot-matrix, Inkjet, Laser printer.

5.3 Describe the operation of a dot matrix, Inkjet, Laser printer.

5.4 List the Major parts and components of a dot matrix, Inkjet, Laser printer.

5.5 Prepare the specification of a dot matrix, Inkjet, Laser printer.

6 Understand the characteristics of special type I/O devices.

6.1 List the special types of I/O devices.

6.2 State the characteristics of Joystick, digitizer, Touch Screen, Plotter, Line Printer and light pen.

6.3 Classify and define different type of scanner.

6.4 State the use of Multimedia projector.

6.5 Define OMR, OCR, ICR and MICR.

7 Understand the operation of Hard disk and Optical disk drives.

7.1 List the Types of Hard Disk Drives (EIDE, SATA, SCSI, And SAS External Hard Disk).

7.2 Describe the working principle of a Hard disk drive with block diagram.

7.3 Describe the recording principle and operation of optical (CD, DVD, Blue Ray) disk drive.

7.4 Describe USB flash memory and portable hard disk.

Practical:

1. Identify the external and internal parts and components of a Keyboard and Mouse.
2. Identify the external and internal parts and components of a mouse.
3. Repair and / or replace external and internal parts and components of a scanner.
5. Repair and / or replace the mechanical assembly and the electronic part of a LCD/LED monitor.
6. Install and configure printers.
7. Perform routine maintenance of printers (LASER, DOT and Inkjet).
8. Repair and / or replace the Mechanical Assembly of LASER printer.
9. Repair and /or replace the fixing unit of LASER printer.
10. Repair and /or replace optical/scanning unit of LASER printer.
11. Repair and / or replace power board of printers (LASER, DOT and Inkjet).
12. Repair and /or Replace the formatter System \ Logic Controller Board of printers (LASER, DOT and Inkjet).
13. Repair and /or Replace of Mechanical Assembly of dot matrix printers.
14. Repair and /or Replace of Mechanical Assembly of Inkjet printers.
15. Identify the major parts of a display adapter/ Video graphics adapter.
16. Identify the external and internal parts and components of a plotter.
17. Identify the external and internal parts and component of a Multimedia Projector.
18. Identify the parts and components of a Hard Disk Drive.
19. Identify the parts and components of a DVD drive.
20. Identify the parts and components of a Blue ray drive.

REFERENCE BOOKS

1. Computer Peripherals − Barry Wilkinson and David Horocks.
2. Microprocessors and Interfacing − Douglas V Hall: McGraw Hill
3. Inside the PC by Peter Norton; Tech Media Publication, New Delhi
4. Microprocessors and Interfacing by Uffenbeck.
5. Hardware and Software of Personal Computers by SK Bose; Wiley Eastern Limited, New Delhi.
6. Upgrading and Repairing PCs By Scott Muller

66842 PRINCIPLES OF DIGITAL ELECTRONICS T P C
3 3 4

AIMS

- To develop knowledge & skill on number systems, codes and binary arithmetic operation.
- To provide knowledge & skill on logic gates, logic circuits, Boolean algebra and logic families.
- To assist to acquire the knowledge & skill on combinational logic circuit.

SHORT DESCRIPTION

Basic concept of digital electronics; Number system & codes; Logic gates, Boolean algebra and logic simplification &Combinational logic circuits.

DETAIL DESCRIPTION

1 Understand basic concept of digital electronics.

1.1 Define digital electronics & Digital Signal.
1.2 Mention the characteristics of digital signal.
1.3 Describe the advantages of working in digital mode.
1.4 Define logic level of digital signal.
1.5 Identify DC voltage level of digital signal.
1.6 Describe parameters of a digital pulse waveform such as rise time, fall time, pulse width and duty cycle.

2 Understand the number system and binary arithmetic operation.

2.1 Define decimal, binary, octal and hexadecimal number system
2.2 Describe decimal, binary, octal and hexadecimal number system.
2.3 Convert one number system to another.
2.4 Compute binary arithmetic & . Complement subtraction Technique.
2.5 State the applications of different number system.

3 Understand the arithmetic codes and code conversion.

3.1 Define 8421, Excess–3code, Gray code, BCD code, Hamming code, Unicode, and ASCII code.
3.2 Describe 8421, Excess–3code, Gray code, BCD code, Hamming code, Unicode, and ASCII code.
3.3 Practice the conversion of one code to another.
3.4 Describe the addition and subtraction of 8421, Excess-3 and BCD coded number.
3.5 State parity checked code and Hamming code.
3.6 Describe the error detection and correction with Hamming code. And parity checked code.

4 Understand the concept of Logic gates.

4.1 Define logic gate.
4.2 Classify logic gate.
4.3 Explain logical statement, truth table, Boolean equation and symbol of AND, OR, NOT, NOR, NAND, EX-OR and EX-NOR gates.
4.4 Shoe NAND & NOR gates used as Universal logic gates.
4.5 State the applications of logic gates.

5 Understand the features of the logic families and digital IC's.

5.1 Classify logic families.
5.2 Define SSI, MSI, LST and VLSI.
5.3 Describe Transistor logic families (DTL & TTL).

5.4 Describe MOS logic families (P-MOS, N-MOS & C-MOS)
5.5 State the meaning of the terms propagation delay time, speed, noise immunity, power dissipation, fan-in, fan-out, operating temperature and power rating of logic circuits.
5.6 State the characteristics of digital IC's.

6 Understand the concepts of electronic circuit of logic gates.
6.1 Describe the operation of standard TTL NAND gate.
6.2 Describe the operation of CMOS NAND & NOR gates.
6.3 State special logic gates such as buffer, tri-state and expandable gates.
6.4 Mention the basic principle of ORing and ANDing.

7 Understand digital IC's
7.1 Define Digital IC's
7.2 Describe fixed function Integrated circuit IC's such as AND, OR, NAND etc.
7.3 Mention IC package, code numbers, and important specification of TTL/MOS commercial IC gates.
7.4 Mention the applications of different logic IC's.

8 Understand logic simplification & design of digital circuit.
8.1 State the theorems of Boolean algebra.
8.2 State DeMorgan's theorems and its applications.
8.3 Determine the terms-Sum of Product (SOP) form and Product of Sum (POS) form.
8.4 Determine the SOP & POS form from truth table.
8.5 Define Karnaugh Map.
8.6 State the structure of Karnaugh map.
8.7 State the simplification process of Boolean expression from a K-map and design logic circuit (up to 4 variables).

9 Understand various combinational logic circuits.
9.1 Define combinational logic circuit with example.
9.2 Describe the operation of half adder and half Sub tractor.
9.3 Explain the operation of full adder and full Sub tractor.
9.4 Describe the operation of 4 bit parallel adder.
9.5 Explain the operation of 4 bit subtraction circuit.
9.6 Describe the operation of parity generator and detector circuit.
9.7 Describe the operation of 4 bit BCD adder.
9.8 Explain the operation of multipliers & divisors.
9.9 Mention the application of combinational logic circuit.

10 Understand the concepts of encoder, decoder and display devices.
10.1 Describe the operation of encoder and decoder circuit.
10.2 State the principle of operation of LCD, LED, seven-segment and dot matrix display.
10.3 Explain the operation of commonly used 4-bit BCD decoder/driver for seven segment display of common Anode/Cathode type.
10.4 Describe the operation of parity generator & detector circuits

11 Understand the features of multiplexers and demultiplexer.
11.1 Define multiplexers and demultiplexer.
11.2 Describe the operation of 2:1, 4:1 and 8:1 multiplexer with logic diagram.
11.3 Describe the operation of 1:2, 1:4 and 1:8 demultiplexers with logic diagram.

11.4 State the use of multiplexer &demultiplexer.
11.5 Explain the operation of Binary comparator.
11.6 Describe the Pin diagram of commonly used 4-bit comparator ICs.
11.7 Distinguish between Decoder and Demultiplexer.

12 Understand the features of sequential logic circuits.

12.1 Define sequential logic circuit
12.2 State the terms clock, timing diagram & latch of digital system.
12.3 Explain the operation of basic SR latch, D flip-flop, clocked flip-flop, J-K flip-flop, Toggle operation & J-K master-slave flip-flop.
12.4 State the concept of positive & negative edge triggering and level triggering,
12.5 Describe the pin diagram of commonly used flip-flop IC's.

Practical :

1 Verify the truth tables of logic gates (OR, AND, NOT, NAND & NOR)

1.1 Select logic gate ICs.
1.2 Select appropriate circuits, required tools, equipments and materials.
1.3 Insert the selected IC to the Breadboard.
1.4 Connect the circuits as per diagram on trainer board.
1.5 Switch on the DC power supply,
1.6 Verify the truth tables.

2 Verify the Truth table of X-OR & X-NOR gate using basic gates.

2.1 Select logic gate ICs.
2.2 Select appropriate circuits, required tools, equipments and materials.
2.3 Insert the selected IC to the Breadboard.
2.4 Connect the circuits as per diagram on trainer board.
2.5 Switch on the DC power supply,
2.6 Verify the truth tables.

3 Show the operation of NAND & NOR gate as universal gates.

3.1 Select logic gate IC of NAND gate & NOR gate.
3.2 Select appropriate circuits, required tools, equipments and materials.
3.3 Insert the selected IC to the Breadboard.
3.4 Connect the circuits as per diagram for AND OR & NOT gate on trainer board.
3.5 Switch on the DC power supply,
3.6 Verify the truth tables of AND OR & NOT gate operation.

4 Design & develop a code converter circuits and observe its output operation.

4.1 Select logic gate ICs.
4.2 Select appropriate circuits, required tools, equipments and materials.
4.3 Insert the selected IC to the Breadboard.
4.4 Connect the circuits as per diagram on trainer board.
4.5 Switch on the DC power supply,
4.6 Verify the truth tables

5 Verify the functions of half adder & half sub tractor.

5.1 Select ICs.
5.2 Draw the pin diagram and internal connection.
5.3 Draw appropriate circuits.
5.4 Select required tools, equipments and materials.
5.5 Connect the circuits as per diagram on trainer board.
5.6 Switch on the DC power supply,
5.7 Verify the truth tables.

6 Verify the functions of full adder & full sub tractor.

6.1 Select ICs.
6.2 Draw the pin diagram and internal connection.
6.3 Draw appropriate circuits.
6.4 Select required tools, equipments and materials.
6.5 Connect the circuits as per diagram on trainer board.
6.6 Switch on the DC power supply,
6.7 Verify the truth tables.

7 Verify the output operation of binary 4 bit parallel adder.

7.1 Select appropriate ICs.
7.2 Draw the pin diagram and internal connection.
7.3 Draw appropriate circuits.
7.4 Select required tools, equipments and materials.
7.5 Connect the circuits as per diagram on trainer board.
7.6 Switch on the DC power supply,
7.7 Verify the truth tables.

8 Show the operation of encoder & decoder.

8.1 Select appropriate ICs.
8.2 Draw the pin diagram and internal connection.
8.3 Draw appropriate circuits.
8.4 Select required tools, equipments and materials.
8.5 Connect the circuits as per diagram on trainer board.
8.6 Switch on the DC power supply,
8.7 Verify the truth tables.

9 Show the operation of a decoder driver & display operation using 7 segment display.

9.1 Select appropriate ICs.
9.2 Draw the pin diagram and internal connection.
9.3 Draw appropriate circuits.
9.4 Select required tools, equipments and materials.
9.5 Connect the circuits as per diagram on trainer board.
9.6 Switch on the DC power supply,
9.7 Verify the truth tables.

10 Show the operation of multiplexer & demultiplexer.

10.1 Select appropriate ICs.
10.2 Draw the pin diagram and internal connection.
10.3 Draw appropriate circuits.
10.4 Select required tools, equipments and materials.
10.5 Connect the circuits as per diagram on trainer board.
10.6 Switch on the DC power supply,
10.7 Verify the truth tables.

11 Verify the truth table of different S-R & D flip-flops.

11.1 Select appropriate ICs.
11.2 Draw the pin diagram and internal connection.
11.3 Draw appropriate circuits.
11.4 Select required tools, equipments and materials.
11.5 Connect the circuits as per diagram on trainer board.
11.6 Switch on the DC power supply,
11.7 Verify the truth tables.

12 Verify the truth table of different J-K flip-flops.

12.1 Select appropriate ICs.
12.2 Draw the pin diagram and internal connection.
12.3 Draw appropriate circuits.
12.4 Select required tools, equipments and materials.
12.5 Connect the circuits as per diagram on trainer board.
12.6 Switch on the DC power supply,
12.7 Verify the truth tables.

13 Show the operation of Toggle flip-flops.

13.1 Select appropriate ICs.
13.2 Draw the pin diagram and internal connection.
13.3 Draw appropriate circuits.
13.4 Select required tools, equipments and materials.
13.5 Connect the circuits as per diagram on trainer board.
13.6 Switch on the DC power supply,
13.7 Verify the Toggle operation.

14 Verify the operation of Binary comparator.

14.1 Select appropriate ICs.
14.2 Draw the pin diagram and internal connection.
14.3 Draw appropriate circuits.
14.4 Select required tools, equipments and materials.
14.5 Connect the circuits as per diagram on trainer board.
14.6 Switch on the DC power supply.
14.7 Verify the truth tables.

REFERENCE BOOKS

1. Digital Fundamentals - Thomas L. Floyd
2. Digital Principles – Roger L. Tokhem
3. Digital system – Ronald J. Tocci and Widmer.
4. Principle of Digital Electronics & Application - Malvino

65841 BUSINESS ORGANIZATION & COMMUNICATION T P C 2 0 2

Aims

- To be able to understand the basic concepts and principles of business organization.
- To be able to understand the banking system.
- To be able to understand the trade system of Bangladesh.
- To be able to understand the basic concepts of communication and its types, methods.
- to be able to perform in writing , application for job, complain letter & tender notice.

SHORT DESCRIPTION

Principles and objects of business organization; Formation of business organization; Banking system and its operation; Negotiable instrument; Home trade and foreign trade.

Basic concepts of communication Communication model& feedback; Types of communication; Methods of communication; Formal & informal communication; Essentials of communication; Report writing; Office management; Communication through correspondence; Official and semi- official letters.

DETAIL DESCRIPTION

1 **Concept of Business organization.**

- 1.1 Define business.
- 1.2 Mention the objects of business.
- 1.3 Define business organization.
- 1.4 State the function of business organization.

2 Formation of Business organization.

- 2.1 Define sole proprietorship, partnership, joint stock company. and co-operative
- 2.2 Describe the formation of sole proprietorship, partnership , joint stock company, & co operative.
- 2.3 Mention the advantages and disadvantages of proprietorship, partnership and joint stock company.
- 2.4 State the principles of Co operative & various types of Co operative.
- 2.5 Discuss the role of co-operative society in Bangladesh.

3 Basic idea of Banking system and negotiable instrument.

- 3.1 Define bank.
- 3.2 State the service rendered by bank.
- 3.3 Describe the classification of bank in Bangladesh.
- 3.4 State the functions of Bangladesh Bank in controlling money market.
- 3.5 State the functions of commercial Bank in Bangladesh
- 3.6 Mention different types of account operated in a bank.
- 3.7 Mention how different types of bank accounts are opened and operated.
- 3.8 Define negotiable instrument.
- 3.9 Discuss various types of negotiable instrument.
- 3.10 Describe different types of cheque.

4 Home & foreign trade

4.1 Define home trade.
4.2 Describe types of home trade.
4.3 Define foreign trade.
4.4 Mention the advantages and disadvantages of foreign trade.
4.5 Discuss the import procedure & exporting procedure.
4.6 Define letter of credit.
4.7 Discuss the importance of foreign trade in the economy of Bangladesh.

5 Basic concepts of communication

5.1 Define communication & business communication.
5.2 State the objectives of business communication.
5.3 Describe the scope of business communication.
5.4 Discuss the essential elements of communication process.

6 Communication model and feedback.

6.1 Define communication model.
6.2 State the business functions of communication model.
6.3 Define feedback .
6.4 State the basic principles of effective feedback.

7 Types and Methods of communication.

7.1 Explain the different types of communication;-
a) Two-way communication b) Formal & informal communication c) Oral & written communication d) Horizontal & vertical communication e) external & internal communication f) spoken & listening communication.
7.2 Define communication method.
7.3 Discuss the various methods of communication.
7.4 Distinguish between oral and written communication.

8 Essentials of communication.

8.1 Discuss the essential feature of good communication.
8.2 Describe the barriers of communication.
8.3 Discuss the means for overcoming barriers to good communication.

9 Report writing.

9.1 Define report , business report & technical report.
9.2 State the essential qualities of a good report.
9.3 Describe the factors to be considered while drafting a report.
9.4 Explain the components of a technical report.
9.5 Prepare & present a technical report.

10 Office management.

10.1 Define office and office work.
10.2 State the characteristics of office work.
10.3 Define filing and indexing.
10.4 Discuss the methods of filing.
10.5 Discuss the methods of indexing.
10.6 Distinguish between filing and indexing.

11 Official and semi-official letters.

11.1 State the types of correspondence.
11.2 State the different parts of a commercial letter.
11.3 Define official letter and semi-official letter.
11.4 Prepare & present the following letters: Interview letter, appointment letter, joining letter and application for recruitment. Complain letters, tender notice.

Ref. Book:

১.উচ্চ মাধ্যমিক ব্যবসায়নীতি ও প্রয়োগ -মোহাম্মদ খালেকুজ্জামান
২.উচ্চ মাধ্যমিক ব্যাংকিং ও বীমা -প্রফেসর কাজী নুরুল ইসলাম ফারুকী
৩.আধুনিক কারবার পদ্ধতি -লতিফুর রহমান
৪.কারবার যোগাযোগ ও সচিবের কার্যপদ্ধতি -প্রফেসর লতিফুর রহমান
ও
প্রফেসর কাজী নুরুল ইসলাম ফারুকী

৫.ব্যবসায়িক যোগাযোগ এবং অফিসের কর্মপ্রণালী –ড. এম, এ, মান্নান
৬.ব্যবসায় যোগাযোগ – মোহাম্মদ খালেকুজ্জামান ও মোঃ মুশাররফ হোসেন চৌধুরী
৭.Business organization & management- M.C. Shukla
৮. Business organization & management- R.N. Gupta