# COMPUTER TECHNOLOGY (66)
## THIRD SEMESTER

| Sl. No | Subject code | Name of the subject | T | P | C | MARKS | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Theory | | Practical | | |
| | | | | | | Cont. assess | Final exam. | Cont. assess | Final exam. | |
| 1 | 6622 | Programming Language-I | 2 | 3 | 3 | 20 | 80 | 25 | 25 | 150 |
| 2 | 6632 | Computer Application-II | 0 | 6 | 2 | - | - | 50 | 50 | 100 |
| 3 | 6841 | Digital Electronics-1 | 3 | 3 | 4 | 30 | 120 | 25 | 25 | 200 |
| 4 | 6832 | Industrial Electronics | 2 | 3 | 3 | 20 | 80 | 25 | 25 | 150 |
| 5 | 5931 | Mathematics-III | 3 | 3 | 4 | 30 | 120 | 50 | - | 200 |
| 6 | 5922 | Physics-2 | 3 | 3 | 4 | 30 | 120 | 25 | 25 | 200 |
| 7 | 5811 | Social Science-1 | 2 | 0 | 2 | 20 | 80 | - | - | 100 |
| | | **Total** | **15** | **21** | **22** | | | | | **1100** |

# COMPUTER TECHNOLOGY (66)
## FOURTH SEMESTER

| Sl. No | Subject code | Name of the subject | T | P | C | MARKS | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Theory | | Practical | | |
| | | | | | | Cont. assess | Final exam. | Cont. assess | Final exam. | |
| 1. | 6642 | Programming Language-2 | 2 | 6 | 4 | 20 | 80 | 50 | 50 | 200 |
| 2. | 6645 | CAD and Graphic Design | 0 | 6 | 2 | - | - | 50 | 50 | 100 |
| 3. | 6844 | Digital Electronics-2 | 3 | 3 | 4 | 30 | 120 | 25 | 25 | 200 |
| 4 | 8531 | Data Structure & Algorithm | 2 | 3 | 3 | 20 | 80 | 25 | 25 | 150 |
| 5. | 6745 | Electrical Circuits & Machines | 3 | 3 | 4 | 30 | 120 | 25 | 25 | 200 |
| 6. | 5942 | Discrete Mathematics | 2 | 0 | 2 | 20 | 80 | - | - | 100 |
| 7. | 5821 | Social Science-2 | 2 | 0 | 2 | 20 | 80 | - | - | 100 |
| | | Total | 14 | 21 | 21 | | | | | **1000** |

6642                    Programming Language-2        T  P  C
                                                     2  6  4

**AIMS**

To develop knowledge and skill in program utilities in C and feature of C++
To develop knowledge of Object Oriented Programming (OOP).
To develop knowledge and skill in Java language, it's syntax, keyword and programming.

**SHORT DESCRIPTION**

Review of formatted I/O, Graphics Elements and program utilities in C.
Object Oriented Programming (OOP),Overview of Data Types, Variables, Arrays,
Operators, and Control Statements, Classes, Objects, Methods, and Constructors,
Inheritance and Polymorphism, Packages, Interfaces, Multithreaded Programming,
Enumerations, Autoboxing, and Annotations (Metadata).

**DETAIL DESCRIPTION**

## Theory:

**1. Understand Graphics Elements in C**
1.1 State the concept of pixel and resolution
1.2 State the format and use of line( ),rectangle( ), bar( ), bar3d( ), Circle( ), ellipse( ),
    fillellipse( ) and sector( ) functions with example
1.3 State the format and use of Arc( ), pieslice( ), drawpoly( ) and fillpoly( ) outtextxy( ) &
    settextstyle( ), cleardevice( ), delay( ), sound( ) & nosound( ), functions with example
1.4 Mention the use of modified cprintf( ) and cscanf( ) functions for I/O operation.
1.5 Write program for developing color image using above graphics functions.
1.6 State the procedure of saving and loading an image in C.
1.7 Show the procedure to move text string on the screen.

**2. Understand the principles of program Utilities in C**
2.1 Describe the principle of detecting a function key with software interrupt.
2.2 Show the use of system timer in C.
2.3 Describe the creation of mouse pointer in C.
2.4 State the procedure of showing text and numeric values in graphics mode
2.5 Show the procedure of moving object in C
2.6 Show the procedure of creating 3D object in C

**3 Understand the concept of object oriented programming (OOP)**
3.1 Describe the software evolution.
3.2 Mention the drawbacks of traditional programming.
3.3 State the terms used in OOP-objects, classes, data abstraction, encapsulation, inheritance,
    polymorphism, message passing, and dynamic binding.
3.4 Mention the name of some the OOP languages.

3.5 State the benefits of OOP.
3.6 Mention the application of OOP.

**4 Understand the overview of C₊₊.**
4.1 Write the features of C₊₊ as OOP.
4.2 Describe the structure of C₊₊ program.
4.3 State the features of classes in C₊₊
4.4 Describe the function overloading.
4.5 Describe the Input /Output Stream (IOS) and related classes of C++
4.6 Describe constructor, copy constructor, destructor and friend functions in C++.
4.7 Write sample I/O program using C++ functions.

**5 Understand the features of Java**
5.1 Describe the history of Java.
5.2 Describe Java development environment steps.
5.3 Mention the differences between Java and C++
5.4 Mention the applications of Java.
5.5 Describe programming style and convention of Java.
5.6 Describe  white space, identifiers, literals, comments, separators and keywords of Java.
5.7 Write the structure of Java program

**6  Understand the use of Data types, Variables, Arrays, Operators and Control Statements in Java**

6.1 State the data types (primitives, non-primitive and literals) of Java programs.
6.2 Describe the declaration and dynamic initialization of variables in java.
6.3 Describe the scope and lifetime of variables in java.
6.4 State the process of accepting input from a user and option panes
6.5 Describe the control flow statements in Java.
6.6 Describe the use of arrays in Java.
6.4 Write Java programs using arrays, operators and control statements.


**7 Understand Classes, Objects, Methods, and Constructors in Java**
7.1 Describe the declaration (syntax) of class and object in Java.
7.2 State for assigning an object reference variables.
7.3 Define Method with syntax.
7.4 State the procedure of adding Method to class.
7.5 Describe the advantages of Method.
7.6 Describe the overloading Method in java.
7.7 Describe the constructor and overloading constructor in java.
7.8 Explain the instance variable hiding, and garbage collection.
7.9 Write java programs relating to class, object, method and constructor.

**8 Understand the inheritance and polymorphism**
8.1 Define super class and sub class.
8.2 Describe the multilevel hierarchy of inheritance.
8.3 Describe the overridden methods in java.
8.4 Describe dynamic run-time polymorphism in java.

8.5 Describe the abstract and object classes in java.
8.6 Mention the uses of final keyword.
8.7 Write java programs relating to inheritance and polymorphism.

## 9. Understand Packages and Interfaces
9.1 Define the packages with syntax
9.2 Describe the function of packages
9.3 Mention the different levels of class member access.
9.4 Define the interfaces with syntax.
9.5 Describe the implementation of interfaces.
9.6 Explain the nested interfaces.
9.7 Describe the variables in interfaces.
9.8 Write java programs that related to package and interface.

## 10 Understand multithreaded programming
10.1 Define multithreaded programming with syntax.
10.2 Mention the different between processed-based and thread-based multitasking
10.3 Mention the several methods of thread class with state diagram.
10.4 Describe the way to create the several types of thread.
10.5 Describe the minimum, default and maximum thread priorities.
10.6 Describe the synchronization interthread communication method.
10.7 Describe the suspending, resuming and stopping threads.
10.8 Write java programs using multithreaded programming method.

## 11 Understand Enumerations, Autoboxing, and Annotations (Metadata)
11.1 Define enumeration with syntax.
11.2 Mention the different between values () and value of () methods.
11.3 Describe the type wrappers in java program.
11.4 Describe the different types of Autoboxing/Unboxing.
11.5 Describe the Annotations with example.
11.6 Describe the different types of built-in annotations.
11.7 Mention the restrictions of annotations.
11.8 Write java programs that related to Enumerations, Autoboxing, and Annotations.

## 12 Understanding I/O Operations
12.1 Describe the Byte stream and Character Stream Classes.
12.2 Describe the Reading Console Input and Writing Console Output.
12.3 Mention the constructors for creating File objects.
12.4 Describe the Reading and Writing files in java.
12.5 Describe flowchart of a complete java streams.
12.6 Describe the Random Access File Streams.
12.7 Write java programs relating I/O operation.

# Practical:

01. Write and execute C program for developing color images.
02. Write and execute C program for moving text on the screen.
03. Write and execute C program for detecting  function key using software interrupt.
04. Write and execute C program for developing a system timer.
05. Write and execute C program for moving object in C
06 Write and execute C program for creating 3D object in C
07. Write and execute sample I/O program using C++ classes
07. Write and execute sample I/O program using C++ functions
08. Install a Java Development Kit /Net beans software
09. Write and execute java program for displaying text messages.
10. Write and execute java programs using arrays and control flow statements.
11. Write and execute java programs using class, object, method and constructor.
12. Write and execute java programs using inheritance and polymorphism.
13. Write and execute java programs using package.
14. Write and execute java programs using interface.
15. Write and execute java programs using multithreaded programming method.
16. Write and execute java programs using Enumerations, Autoboxing, and Annotations.
17. Write and execute java programs using I/O operation.

**REFERENCE BOOKS AND URL.**
1. The Complete Reference of Java- Herbert Schildt
2. JAVA How to Program- P.J. Deitel and H.M. Deitel
3. সান জাভা ২ জাহিদ খান; মিন্টু লাল সাহা; জয়ন্ত কুমার সাহা; আব্দুল আহাদ মুরাদ

Related URL links :

http://www.informit.com/library/content.aspx?b=STY_Java2_24hours&seqNum=24
http://java.sun.com/developer/onlineTraining/JavaIntro/contents.htmlinks
http://www.homeandlearn.co.uk/java/java.html
http://java.sun.com/ : Java Development Kit, Development tools, Java Tutorial
http://www.eclipse.org/ : A vendor-neutral open development platform and application frameworks for building software
http://www.uml.org/: UML resources
http://www.bruceeckel.com/ : Free electronic version of the book

| | | T | P | C |
|---|---|---|---|---|
| **6645** | **CAD AND GRAPHICS DESIGN** | 0 | 6 | 2 |

**AIMS**
- To develop the  skills for drawing & designing by CAD package.
- To develop the ability to design graphical objects including text, color and images.
- To develop Knowledge and skill on Graphics Animation

**SHORT DESCRIPPTION**
Auto CAD, Adobe Photoshop, Adobe Illustrator and Quark Xpress.


**Auto CAD**

**1.     Drawing Lines, Arcs and Circles**

1.1.    Install a general-purpose drawing and design software (Auto CAD) and dedicated PCB design & simulation software.

1.2.    Setup the drawing area and paper size.
1.3.    Identify different menus and dialog boxes of CAD packages.

1.4.    Use the commands to draw lines, rectangles using polar and rectangular coordinates.
1.5.    Create pline and spline using single and 3D POLY commands.
1.6.    Draw circle, arc, donut, ellipse and simple construction lines.
1.7.    Use the command for freehand sketches.

**2.     Editing and modifying objects.**
2.1.    Select and erase the objects using different technique.
2.2.    Duplicate the objects using copy/grips, offset, mirror and array command.
2.3.     Rearrange the objects using move and rotate commands.
2.4.    Resize  the  objects  using  stretch,  scale,  extend,  trim  and  length commands.
2.5.    Break the objects.
2.6.    Explore the objects.
2.7.    Chamfer and fillet the objects.


**3.     Dimension layers and hatch pattern.**
3.1.    Use commands to set up the dimension variables and scale.
3.2.    Create  and  edit   linear,  angular,  diameter,  radius  and  ordinate dimensions.
3.3.    Dimension multiple objects.
3.4.    Create  leads and annotations.
3.5.    Create and name the layers.
3.6.    Make current layer and control layer visibility.
3.7.    Freeze, lock and unlock  layers.
3.8.    Set  layer color & line type.
3.9.    Create and edit  line text, paragraph text.

3.10.   Insert text from outside of CAD.

**4.      Create a simple schematic diagram and PCB layout.**
4.1.    Run any professional PCB layout packages.
4.2.    Load the layout drawing (symbols, pads, lines, components, etc.) from the components library.
4.3.    Configure the system for units and co-ordinates.
4.4     Edit the PCB layout and simulate the circuit using appropriate circuit simulation software
4.5     Print Single layer PCB layout in a tracing paper by using a Printer/Plotter

**Adobe Photoshop**
**5.      Work with Image, Image Color and Channels**
5.1.    Install Adobe Photoshop Software
5.2.    Change image size, resolution and canvas size.
5.3.    Practice with foreground and background color, opacity and feather.
5.4.    Change the color with the help of color piker.
5.5.    Practice with Hue, HSB, bitmap and gray color.
5.6.    Practice on creating Channel, RGB Channel, CMYK Channel and multi Channel
5.7.    Practice on Using various Palettes
**6.      Work with Painting and Editing**
6.1.    Practice on using Painting, Painting tools, editing tools.
6.2.    Practice on using Paint Bucket tools and Brush tools.
6.3.    Use lasso selector tools including freelance and point base lasso selector tools.
6.4.    Practice with magic wind tools and pen tools.
6.5.    Practice with path builder and anchor point.
6.6.    Practice with smudge, sharpen, lighten and dark tools.
6.7.    Practice with rubber stamp, healing and patch tools.
**7.      Work with layer, filter and color mapping and adjusting.**
7.1.    Practice on creating layers, arrange layers ,merge layers and link between layers.
7.2.    Practice on using filter, destructive filters, stylize filters, high pass filter and noise filter.
7.3.    Practice on using gradient tools, eyedropper tools.
7.4.    Practice on using color mapping and adjusting.
7.5.    Practice on using erase and pencil, custom shape tools.
7.6.    Practice on using bevel emboss, color range and layer linking.
**8.      Work with projects**
8.1.    Design a Shopping Bag/Calendar/Gift Box/ Bill Board/Cover Page etc.
8.2.    Print an image with color separation.

**Adobe Illustrator**
**9.      Work with objects, layers and path to draw and edit objects.**
9.1.    Install Adobe Illustrator Software.
9.2.    Practice on using rectangles, ellipses.
9.3.    Practice on using polygon tool, star tool and spiral tool
9.4.    Practice on using group selection tools.
9.5.    Practice on creating layers, edit layers, lock & hide layers, merge layers, arrange layers, move or copy items between layers.

9.6.    Draw paths (Open and Close Paths)

9.7.    Apply anchor point tool, delete anchor point tool and convert direction point tool.

9.8.    Edit path with smooth tool, erase tool, reshape tool, scissor tool and knife tool.

**10.    Work with coloring and transformation of objects**

10.1.    Demonstrate the usage of brushes palette, fill and stroke.

10.2.    Demonstrate the usage of eyedropper and paint bucket tool.

10.3.    Practice on using color palette, color models and custom colors.

10.4.    Practice with transformation tool .

10.5.    Practice with transform palettes, align palettes and pathfinder palette.

10.6.    Practice with divide/trim/merge/crop/outline tool.

10.7.    Practice on using Hard and Soft command.

**11.    Work with text, typography, effects, chart & graph and filters**

11.1.    Practice with type tool, point text, area text and link text.

11.2.    Type text on a path and move text along a path.

11.3.    Practice on different commands of character palette and paragraph palette.

11.4.    Practice with Tab palette and MM design palette.

11.5.    Practice with special effect on text/objects.

11.6.    Practice and using charts and graphs

11.7.    Practice on creating filter, distort filters and stylize filters

**12.    Work with projects**

12.1.    Design Greeting Card/Calendar/Post Card etc.

12.2.    Print the project

**QuarkXpress**

**13.    Work with basic elements of page makeup program, Palettes, Style Sheet and Master Page**

13.1.    Install Quark Xpress Software

13.2.    Practice on using Page make up

13.3.    Change measuring units.

13.4.    Practice on tracking, kerning, leading, paragraph, justification and hyphenation.

13.5.    Set up column, margin, registration marks and screens.

13.6.    Demonstrate the operations of global control and local control.

13.7.    Practice on tools, measurement palette.

13.8.    Demonstrate the functions of palettes.

13.9.    Practice on creating and editing Style sheet.

13.10.  Practice on creating and editing Master Page

13.11.  Apply master page with a document

**14.    Work with text and picture boxes**

14.1.    Practice on creating new text box, Insert, edit and import text in the text box.

14.2.    Practice on Linking and Unlinking text boxes.

14.3.    Align, rotate, setup colors and shades in the text.

14.4.    Practice on creating picture box, changing the size, location and shape of

picture box.
- 14.5.    Import and add graphics in a picture box.
- 14.6.    Apply colors and shades of picture box.

**15.    Work with layout features, character and  paragraph**
- 15.1.    Practice on drawing arrow line, end caps line and frame.
- 15.2.    Practice on creating new frame style.
- 15.3.    Practice on using bullets and lists.
- 15.4.    Practice on Applying character spacing, tracking and kerning.
- 15.5.    Practice on using horizontal & vertical scaling, hyphenation and justification
- 15.6.    Practice on using leading.

## REFERENCE BOOKS AND URL

1.    AutoCAD
    –    Samuel A Mallick
    -    Engr. Md. Shah Alam

2.    Adobe Photoshop/Adobe Illustrator/Quark Xpress
    –    Bappi Ashraf
    –    Mahbubur Rahman
    –    Shajahan Sajib
    –    Azizur Rahamn
    –    Reference Copy Adobe Corporation Publication

**6844**　　　　**DIGITAL ELECTRONICS -II**　　　　**T　P　C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　**3　3　4**

**AIMS**

• To be able to acquire the knowledge & skill on counters, shift registers and
their applications.

• To be able to acquire the knowledge & skill on semiconductor memories & ALU

• To be able to acquire the knowledge & skill on A/D and D/A converters

• To familiarize with PLD & simple computer (SAP-1)

**SHORT DESCRIPTION**

Sequential system concept; Flip-flops; Registers & counters;
Semiconductor Memories; A/D & D/A converters, PLD and SAP-1.

**DETAIL DESCRIPTION**

**Theory:**

**1. Understand the clocked Flip Flops.**
1.1　Describe the operation of sequential logic system with block diagram.
1.2　Define the synchronous and asynchronous sequential logic circuit.
1.3　State the concept of level clocking and edge triggering.
1.4　Explain the operation of clocked SR Flip Flop.
1.5　State the advantages of edge triggering in Flip Flop.
1.6　Explain the operation of clocked D, T, JK and Master-slave Flip Flops.
1.7　Describe the operation of RS Flip Flop as a de-bounce switch.
1.8　Describe the operation of Flip Flop as a frequency division circuit.
1.9　State the application field of Flip Flops.

**2. Understand registers and its application.**
2.1　Define register.
2.2　Mention different types of registers.
2.3　Mention the use of shift registers.
2.4　 List the different types of common shift register IC chips
2.5　Describe the operation of buffer register.
2.6　Explain the basic principle of operation of serial in - serial out shift registers.
2.7　Explain the operation of parallel in- parallel out shift registers.
2.8　Describe the operation of left shift, right shift and universal shift registers.
2.9　Describe the states (both two and three) of registers.

**3. Understand the binary counter circuits.**
3.1　Define binary counter.
3.2　State the difference between asynchronous and synchronous counter.
3.3　Explain the operation of asynchronous, synchronous and decade counter.
3.4　State the modulus of a counter.
3.5　Describe the principle of divide - by- n counter.
3.6　Describe the operation of a binary up - down counter.
3.7　State the principle of ring & Johnson counter.

3.8   State the application of different types of counters.
3.9   Describe the operation of digital clock.

## 4. Understand semiconductor memories.
4.1   List the type of memories.
4.2   Describe the principle of serial and parallel access memory.
4.3   Explain the internal organization of semiconductor memory.
4.4   Describe the technique of memory addressing.
4.5   Explain the read and write operation of semiconductor memory.
4.6   Explain the principle of static and dynamic RAM.
4.7   Describe the principle and operation of ROM, PROM, EPROM and EEPROM.
4.8   List the application of some commercial memory ICs.

## 5. Understand arithmetic logic circuit.
5.1   Mention the basic principle of ALU.
5.2   List the application of ALU.
5.3   Identify some commercial ALU chips.
5.4   Mention the principle of digital comparators.
5.5   Mention the principle of binary rate multiplier with block diagram.
5.6   List the application of digital comparators.
5.7   Identify some commercial comparators and binary rate multiplier ICS.

## 6. Understand D/A converter.
6.1   Mention the principle of level conversion.
6.2.   Describe the principle of D/A conversion.
6.3   Mention the types of D/A converter.
6.4   Explain the operation of a binary weighted D/A and R-2R ladder D/A converter.
6.5   State the terms – resolution, percentage resolution, and accuracy,
        offset error and settling time as specification of D/A converter.
6.6   Solve problems on resolution, full scale output current, output voltage
        and accuracy of D/A converter.
6.7   State the application field of D/A converter.
6.8   List the application of popular D/A converter ICS.

## 7. Understand A/D converter.
7.1   State the general principle of A/D conversion
7.2   List the type of A/D converter.
7.3   State the working principle of 3-bit parallel A/D converter.
7.4   Describe the operation of Digital Ramp A/D converter
7.5   Explain the operation of successive approximation, dual slope and Flash A/D
        converter.
7.6   State the terms – resolution, accuracy, and conversion time as
        specification of A/D converter.
7.7   List the applications of popular A/D converter ICS.
7.8   Describe the operation of sample & hold circuits and its application.

## 8. Understand the programmable logic devices.
8.1   Defines PLD.
8.2   State the advantages of PLD.
8.3   Describe the principle of PLD.
8.4   Discuss simplified logic diagram of PLA, PAL and GAL.

8.5   Describe the architecture of two input PLA, PAL and GAL.
8.6   State the basic feature of FPGA.
8.7   Describe the programming process SPDL
8.8   Describe the complex programmable logic device (CPDL).
8.9   Interpret standard PAL and GAL numbering.

## 9. Understand the organization of a SAP-1
9.1   State the meaning of SAP.
9.2   State the function of each stage of SAP-1 with block diagram.
9.3   State the function of control signals i.e. Enable, Load, Clock and
9.4   Clear of each register.
9.5   State the instruction for accessing and storing data in RAM of SAP-1.
9.6   Describe the bus organization of SAP- 1.

## 10. Understand the Micro and Macro Instruction of SAP-1
10.1   Describe the function of controller sequencer.
10.2   State the control word/micro instruction of controller sequencer.
10.3   State the meaning of macro instructions and their corresponding
        binary op-code used in SAP-1
10.4   State the concept of machine cycle, fetch cycle, execution cycle and
        instruction cycle
10.5   Describe the fetching steps of micro instruction in different T states.
10.6   Describe the execution steps of micro instruction in different T states.

## Practical:
1. To prepare the clocked RS, D, T, JK & Master-slave flip-flops and check its
    truth table/operations.
2. To prepare different types of shift registers and check its operation.
3. To prepare different types of counter and check its operation.
4. To prepare an asynchronous binary counter and check the output.
5. To prepare a synchronous decade counter and check the output.
6.  Check the operation of ALU.
7. To show the read / write operation of a 4 bit memory chip.
8. To show the D/A conversion procedure of D/A converter.
9. To show the A/D conversion procedure of A/D converter.
10. To the operation of digital clock
11. To the operation of digital volmeter.
12. Construct and verify the operation of SPLD by using logic gates.

## REFERENCE BOOKS
1. Digital principles and application

                                            ‒ A P Malvino

2. Digital Computer Electronics

                                            ‒ A P Malvino

3. Digital System

                                            ‒ Tocci

4. Modern Digital Electronics

                                            - R. P. Jain

5. Digital Fundamentals.

| 6745  ELECTRICAL CIRCUITS AND MACHINES | T | P | C |
|---|---|---|---|
| | 2 | 3 | 3 |

## *AIMS*

- To provide understanding and skill on AC circuits.
- To develop concept on polyphase system.
- To familiarize with the construction and operating principle of transformer.
- To develop understanding on the principles of DC motor.
- To develop knowledge and skill on 3-phase and 1-phase induction motor.
- To develop understanding on the principle of synchronous motor.

## *SHORT DESCRIPTION*

Complex algebra – application to AC circuits; RLC series and parallel circuits; Polyphase system; Star and delta connection; Transformer; Rotating electrical machines; DC motor; 3-phase induction motor; 1-phase induction motor; Synchronous motor and stepper motor.

## *DETAIL DESCRIPTION*

**Theory :**

**1      Apply the Principle of Vector and Vector Quantities.**
    1.1      Define Vector Quantities.
    1.2      Explain the Vector representation of alternating voltage and current.
    1.3      Explain the Vector in polar and rectangular form.
    1.4      Formulate the relation between Vectors Expressed in rectangular and polar co-ordinate.
    1.5      Solve problems related to Vector sum and difference, multiplication and division.

**2      Apply the concept of AC series circuit containing resistor, Inductor and Capacitor.**
    2.1 Draw the circuit  containing resistor, Inductor and Capacitor**.**
    2.2  Draw the Vector diagram RLC series circuit.
    2.3 Compute the results of RLC series circuit in cartesian form and polar form notation.
    2.4 Solve problems of RLC series circuit in rectangular co-ordinate system and polar co-ordinate system.
    2.5 Draw the circuit containing resistor, Inductor and Capacitor In parallel.
    2.6 Draw the Vector diagram of RLC parallel circuit.

2.7 compute the results of parallel AC circuit in cartesian form and polar form notation.
2.8 Solve problems on parallel Ac circuit in cartesian form and polar form notation.

## 3      Understand the application of complex algebra for power calculation.
3.1      Calculate power employing complex form.
3.2      Calculate VAR employing complex form.
3.3      Describe the conjugate method of calculating real power.
3.4      Describe the conjugate method of calculating reactive power.


**POLYPHASE SYSTEM**
## 4      Understand the concept of poly-phase system.
4.1      State the term poly-phase system.
4.2      List the advantages of poly-phase system over single phase system.
4.3      State the generation of poly-phase emf.
4.4      Sketch the phase voltage wave diagram.
4.5      Identify the phase sequence of poly-phase system.
4.6      State the effects of reverse phase sequence.
4.7      Explain the methods of checking phase sequence.
4.8      Sketch the phase sequence diagram of 3-phase voltage.

## 5      Apply the concept of polyphase for interconnection.
5.1      Write down possible ways of interconnection of three phase system.
5.2      Draw the circuit diagram of star connected 3-phase, 3-wire system.
5.3      List the application of 3-phase, 3-wire, star connected system.
5.4      Sketch 3-phase, 4-wire, star connection system.
5.5      List application of 3-phase, 4-wire star connection system.
5.6      Draw the vector diagram of 3-phase, 4-wire, star connection system.
5.7      Interpret the relation between line and phase voltage and current in a balanced 3-phase, 3-wire, star connection system.
5.8      Simplify the relation between line and phase voltage and current in a balanced 3-phase, 4-wire star connection system.

## 6      Understand the function of 3-phase star connection system.

6.1      Define Balance and Unbalance System
6.2      Identify neutral wire in a 3-phase star connection system.
6.3      Evaluate the current in the neutral wire in an unbalanced 3-phase, 4-wire, star connected system.
6.4      Draw the phasor diagram of 3-phase, 4-wire star connected system.
6.5      Discuss the formula $I_L = I_P$ and $V_L = \sqrt{3}\, V_p$
6.6      Calculate volt-ampere, power and power factor in a balanced      3-phase, 4-wire star connected system.
6.7      Solve problems on star connected (balanced and unbalanced) power system.

## 7      Understand the features of 3-phase delta connection system.
7.1      Draw the circuit diagram of a 3-phase delta connected system.
7.2      Draw the phasor diagram of delta connected system.

7.3      Express the deduction of the formula $V_L = V_P$ and $I_L = \sqrt{3} I_P$ for connected system.

7.4      Simplify the relation between line and phase current & voltage in a balanced delta connected system.

7.5      Calculate the volt-ampere, power and power factor in a balanced 3-phase, delta connected system.

7.6      Solve problems on delta connected balanced system.

7.7      Compare the advantages of star connected system with those of delta connected system.

## TRANSFORMER

**8      Understand the principle of operation of transformer.**
8.1      Define transformer.
8.2      Explain the working principle of transformer.
8.3      Explain the emf equation of a transformer.
8.4      Explain no load operation of transformer.
8.5      Explain operation of transformer at load condition.
8.6      Solve problems related.

**9      Understand the constructional features of transformer.**
9.1      Describe the constructional features of transformer.
9.2      Identify different types of transformer.
9.3      List the uses of transformer.
9.4      Explain transformation ratio (voltage, current and turns).
9.5      Solve problems on transformation ratio.

**10      Understand the concept of losses, efficiency and voltage regulation of transformer.**
10.1      Explain different losses in transformer.
10.2      Explain the factors affecting core loss and copper loss.
10.3      Explain the equation for maximum efficiency.
10.4      Explain the open circuit test and short circuit test of a transfoer.
10.5      Solve problems on efficiency and maximum efficiency.
10.6      Explain the equation for voltage regulation of transformer.
10.7      Solve problems on voltage regulation of transformer.

## DC MOTOR

**11      Understand the principle of DC motor.**
11.1      Explain the working principle of DC motor.
11.2      Explain generator action of motor.
11.3      Explain the term torque, running torque and break down torque.
11.4      Explain the torque equation of motor.
11.5      Describe the constructional features of DC motor.
11.6      Explain the function of commutator.

**12      Understand the characteristics of DC motor.**
12.1      Identify different types of DC motor.
12.2      Explain the performance characteristics of different types of DC motor.
12.3      Describe starting methods of DC motor.
12.4      Describe speed control of DC motor.

INDUCTION MOTOR
**13      Understand the principle of induction motor.**
        13.1    Explain the general principle of induction motor.
        13.2    Distinguish between the principles of induction motor and conduction motor.
        13.3    Define sleep and sleep speed.
        13.4    Identify the types of induction motor.
        13.5    List the uses of induction motor.

**THREE-PHASE INDUCTION MOTOR**
**14      Understand the working principle of 3-phase induction motor.**
        14.1    Explain the construction of 3-phase induction motor.
        14.2    Explain the construction of a 3 phase squirrel case induction motor.
        14.3    Explain the construction of a 3 phase  wound rotor induction motor.
        14.4    State the production of rotating magnetic field in a 3-phase induction motor.
        14.5    Describe the methods of starting 3-phase induction motor.
        14.6    State the principles of speed control of 3-phase induction motor.

SINGLE-PHASE INDUCTION MOTOR
**15      Understand the working principle of 1-phase induction motor.**
        15.1    Explain working principle of 1-phase induction motor.
        15.2    Explain the self starting method of single phase motor.
        15.3    Describe the principles of operation of standard split phase motor.
        15.4    Describe the principles of operation of capacitor motor.
        15.5    Describe the principles of operation of shaded pole motor and repulsion motor.
        15.6    Identify hysteresis motor, universal motor, reluctance motor and AC series motor.
        15.7    Mention the methods of speed control of single phase induction motor.


**SPECIAL MOTORS**
**16      Understand the working principle of synchronous motor and Stepper motor.**
        16.1    Explain the principle of operation of synchronous motor.
        16.2    Describe the constructional features of synchronous motor.
        16.3    Describe the starting methods of synchronous motor.
        16.4    Explain the working principle of stepper motor.
        16.5    List the different types of stepper motor.
        16.6    Describe construction of different stepper motors.


**Practical :**

**1       Determine the value of resistance, inductance & capacitance and draw vector diagram of RLC series circuit.**
        1.1     Sketch the circuit diagram for RLC series circuit.
        1.2     Select equipment, tools & materials for the experiment.
        1.3     Connect the circuit according to the circuit diagram.
        1.4     Check all connection points before energizing the circuit.

1.5      Record the readings from the meter connecting power supply to the circuit.

1.6      Find the values of resistance, inductance, capacitance and phase angle from the relevant data.

1.7      Verify the impressed voltage is equal to the vector sum of voltage drops in each parameter.

1.8      Sketch the vector diagram with the help of relevant data as obtained.

**2      Determine the values of resistance, inductance, capacitance and draw the vector diagram of RLC parallel circuit.**

2.1      Sketch the circuit diagram for RLC parallel circuit.

2.2      Select equipment, tools & materials for the experiment.

2.3      Connect the circuit according to the circuit diagram.

2.4      Check all connection points before energize the circuit.

2.5      Record the readings from the meter connecting power supply to the circuit.

2.6      Find the value of resistance, inductance, capacitance and phase angle from the relevant data.

2.7      Verify the line current is equal to the vector sum of branch currents.

2.8      Sketch the vector diagram with the relevant data as obtained.

**3      Demonstrate poly-phase power system and identify phase sequence.**

3.1      Sketch the circuit diagram of a poly-phase power system showing phase sequence.

3.2      Select equipment, tools & materials for the experiment.

3.3      Study and connect the poly-phase system.

3.4      Observe the voltages by voltmeter.

3.5      Observe the phase voltages by oscilloscope.

3.6      Compute phase sequence.

**4      Measure line and phase voltage & current in a 3-phase star connected inductive load.**

4.1      Sketch the circuit diagram for 3-phase star connected load.

4.2      Select equipment, tools & materials for the experiment.

4.3      Connect the circuit according to the circuit diagram

4.4      Check all connection points before connecting power supply.

4.5      Record the readings of instruments.

4.6      Compare the recorded values with calculated values.

4.7      Note down the observations remarks.

**5      Measure line and phase current & voltage in 3-phase delta connected inductive load.**

5.1      Sketch the circuit diagram for 3-phase delta connected load.

5.2      Select equipment, tools & materials for the experiment.

5.3      Connect the circuit according to the circuit diagram.

5.4      Check all connection points before connecting power supply.

5.5      Record the readings of the instruments.

5.6      Compare the recorded values with calculated values.

5.7      Note down the observations.

**6**     **Measure current, voltage and power in a balanced 3-phase star connected inductive load and construction of vector diagram.**
   6.1     Sketch the circuit diagram for measuring power by 3 watt meters of a 3-phase system.
   6.2     Select equipment, tools & materials for the experiment.
   6.3     Connect the circuit according to the circuit diagram.
   6.4     Check all connection points and equipment & instruments before actual operation.
   6.5     Record the readings from the meters in the circuit.
   6.6     Calculate the power from the formula
           $P_t = W_1 + W_2 + W_3$ and $3V_p I_p \cos \theta$
   6.7     Draw the vector diagram using relevant data as obtained.
   6.8     Note down the observations.

**7**     **Measure current, voltage and power in a balanced 3-phase delta connected inductive load and construction of vector diagram.**
   7.1     Draw the circuit diagram for measuring power by 3-watt meter method of 3-phase delta connected load.
   7.2     Select equipment, tools & materials for the experiment.
   7.3     Connect the circuit according to the circuit diagram.
   7.4     Check all connections, equipment and instruments before actual operation.
   7.5     Record the reading from the meters used in the circuit.
   7.6     Calculate the power from the formula
           $P_t = W_1 + W_2 + W_3$ and $P_t = \sqrt{3} \, V_{IL} L_{LI} \cos\theta$
   7.7     Draw the vector diagram using obtained data.
   7.8     Note down the observations.

**8**     **Find the transformation ratio of a transformer.**
   8.1     Develop a circuit to perform the experiment.
   8.2     Select required equipment and materials.
   8.3     Connect the components according to the circuit diagram.
   8.4     Check the connections.
   8.5     Record the primary ($E_P$) and secondary ($E_S$) voltages.
   8.6     Calculate the transformation ratio using the relation
           $$\frac{E_S}{E_P} = \frac{N_S}{N_P} = K$$
   8.7     Note down the observations.

**9**     **Perform open circuit test of a single phase transformer.**
   9.1     Select the circuit diagram for the experiment.
   9.2     Select required, equipment, tools and materials.
   9.3     Connect all the equipment according to the circuit diagram.
   9.4     Connect the low side to its rated voltage to the power supply keeping high side open.
   9.5     Record instrument readings.
   9.6     Calculate required data.
   9.7     Draw no load vector diagram with the data obtained.
   9.8     Note down the observations.

**10**    **Perform short circuit test of a single phase transformer.**

10.1 Select the required circuit diagram for the experiment.
10.2 Select required, equipment, tools and materials.
10.3 Connect the equipment according to the circuit diagram.
10.4 Energize the circuit by applying reduced voltage.
10.5 Record copper loss and calculate $R'_e$ , $X'_e$ and $Z'_e$.
10.6 Note down the observations.

**11     Construct load versus speed characteristic curve of DC shunt motor.**
11.1 Draw the required circuit diagram for the experiment.
11.2 Select the instrument and materials required.
11.3 Connect all the instrument's according to diagram.
11.4 Take the necessary data from the connected instruments.
11.5 Draw the required curve.
11.6 Note down the observations.

**12     Study the components/parts of a 3-phase induction motor.**
12.1 Prepare a list of the parts of a 3-phase induction motor.
12.2 Dismantle the components/parts of the motor.
12.3 Develop sketches of each part.
12.4 Sketch the developed diagram of the windings of the motor.
12.5 Assemble the dismantled parts.
12.6 Note down the observations.

**13     Operate a 3-phase induction motor.**
13.1 Sketch the circuit diagram.
13.2 Select required, equipment, tools and materials.
13.3 Connect starter with motor.
13.4 Connect power supply to the circuit.
13.5 Observe the operation.
13.6 Measure the speed of the rotor.
13.7 Note down the observations.

**14     Start a 1-phase capacitor type motor/ceiling fan with regulator.**
14.1 Select the equipment and tools required for the experiment.
14.2 Sketch a working diagram.
14.3 Identify the two sets of coils.
14.4 Connect the capacitor with the proper set of coil.
14.5 Connect power supply to the fan motor.
14.6 Test the rotation of the motor opposite direction by changing the capacitor connection.
14.7 Note down the observations.

**15     Operate a synchronous motor by changing field excitation.**
15.1 Select required equipment, tools, machine and materials.
15.2 Sketch the circuit diagram.
15.3 Connect the instrument according to the diagram.
15.4 Check the circuit.
15.5 Change the field excitation.
15.6 Record armature and field current.
15.7 Draw the 'V' curve.
15.8 Note down the observations.

**REFERENCE BOOKS**

1. Electrical Technology – B. L. Theraja
2. Electrical Machine – Siskind

# 8531   DATA STRUCTURE & ALGORITHM
## T  P  C
## 3  3  4

**AIMS**

• To provide the knowledge & skill on data structures.

• To provide the knowledge & skill on writing simple algorithms.

**SHORT DESCRIPTION**

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

**DETAIL DESCRIPTION**

**Theory :**
**DATA TYPES, DATA STRUCTURE AND ALGORITHM**
**1 Understand the idea of the data structure.**
      1.1     Define data & information.
      1.2     State data types.
      1.3     Define  Memory Location, array, & list.
      1.4     State the types of array, & list.
      1.5     Define String.
      1.6     Define data structure.
      1.7     State the meaning of field, record and files.
      1.8     Define stack & queue with example
      1.9     Define trees , heaps, hashing function table & hashing table.

**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
      2.5     Define Time-space Trade off.

**ARRAYS, RECORDS, POINTERS AND LINKED LISTS.**

**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 represent 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.

## STACKS, QUEUES & RECURSION

## 5. Understand the Operation of Stack

5.1      State the meaning of the terms PUSH & POP.

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 Deques.

6.2      Describe  Priority queues.

6.3      Write the algorithms for inserting/deleting data into/from queues.

## 7. Understand the Operation of Recursion.

7.1      Define Recursion

7.2      Explain the use of recursive subroutines.

7.3      Write the algorithms to compute N! and Fibonacci numbers by recursive subroutines.

## SEARCHING & SORTING
## 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 .

10.5      Describe the process of variable length storage with fixed maximums.

10.6      Describe the process of linked storage  structure.

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

**REFERENCE BOOKS:**

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

| | | T | P | C |
|---|---|---|---|---|
| **5942** | **DISCRETE MATHEMATICS** | **2** | **0** | **2** |

**AIMS**
- To develop knowledge of mathematical logic applied in digital computers.
- To assist to acquire knowledge of mathematics in developing algorithms.
- To provide knowledge of mathematics in solving problems by computers.

## *SHORT DESCRIPTION*

Basics of discrete mathematics; Vector & matrices; Counting; Probability theory; Graphs and Binary trees.

## *DETAIL DESCRIPTION*

**BASICS OF DISCRETE MATHEMATICS & RELATIONS**

**1      Understand the basics of discrete mathematics.**
1.1     Describe the importance of discrete mathematics in digital computer system.
1.2     Describe the ideas of logic sets and functions in discrete mathematics.
1.3     Define ONE-ONE and ONTO functions.
1.4     Describe the algorithm & functions of real life problem.
1.5     Describe the complexities of algorithm.

**2      Understand the fundamentals of relations.**
2.1     Define relations.
2.2     Mention the properties of relation.
2.3     Describe the kinds of relations.
2.4     Define inverse relation.
2.5     Mention the representations of relations on finite sets.
2.6     Describe the composition of relations.
2.7     Describe the composition of relation and matrices.

**VECTORS & MATRICES**
**3      Understand the concept of vectors and matrices.**
3.1     Define vectors and matrices.
3.2     Define Echelon matrix .
3.3     Describe the Gaussian elimination in matrix form.
3.4     Describe the algorithm of matrix arithmetic.
3.5     Matrix solution of a system of Linear Equation .

**COUNTING**
**4      Understand the concept of counting.**
4.1     Define counting.
4.2     Describe the binomial coefficients and Pascal's triangle.

4.3     Describe Pigeonhole principle.

4.4     Describe the counting problems and tree diagram.

**5     Understand the probability theory.**

5.1     Define simple space and events.

5.2     Describe the finite probability spaces.

5.3     Describe the theorems on finite probability spaces.

5.4     Define conditional probability.

5.5     Define independent events.

5.6     Describe the repeated trials.

**GRAPHS**

**6     Understand the features of graphs, directed graphs and machines.**

6.1     Describe the graphs and multi graphs.

6.2     Describe the degree of a vertex.

6.3     State the meaning of connectivity.

6.4     Define finite graphs and trivial graphs.

6.5     Describe sub graph, isomorphic and homomorphic graph.

**BINARY TREES**

**7     Understand the features of binary trees.**

7.1     Define binary trees.

7.2     Describe the complete and extended binary trees.

7.3     Mention the properties of trees.

7.4     Describe the method of binary search trees.

7.5     Describe the method of traversing binary trees.

| 5821 | SOCIAL SCIENCE – II<br>(BANGLADESH : HISTORY & CULTURE) | T | P | C |
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**উদ্দেশ্য**

- পদ্মা-মেঘনা-যমুনা বদ্বীপ অধ্যুষিত ভৌগোলিক অঞ্চলে বাঙ্গালী সমাজ গঠন এবং নানা ঐতিহাসিক বিবর্তনের পর্যায় পেরিয়ে গঠিত আধুনিক বাংলাদেশ সম্পর্কে শিক্ষার্থীদের যথার্থ অবগত করানো এবং তাদের সঠিক বোধ সৃষ্টিকরণ।

- প্রাকৃতিক ও অর্থনৈতিক কাঠামোর পরিমন্ডলে বাংলাদেশের সাংস্কৃতিক বিকাশের সাথে শিক্ষার্থীদের উজ্জীবিত করে বাংলাদেশের যোগ্য ও পরিশীলিত নাগরিক হিসাবে যথার্থ বিকশিতকরণ।

**সংক্ষিপ্ত বিবরণী**

*ইতিহাস*

- ইতিহাসের সংজ্ঞা।

- বাংলাদেশের আবহাওয়া ও অধিবাসী।

- প্রাগৈতিহাসিক ও প্রাচীনকালে বাংলাদেশ।

- বাংলায় মুসলমানদের আগমন, প্রতিষ্ঠালাভ ও শাসন — খলজী ও তুর্কী শাসনে বাংলায় স্বাধীন সুলতানী প্রতিষ্ঠা; বাংলাদেশে শাহী আমল, আফগান ও মোঘল আমলে বাংলার শাসন।

- বাংলায় ইউরোপীয় বণিকদের আগমন; নবাবী আমলে বাংলার শাসন ব্যবস্থা; বাংলায় ইংরেজ শাসন ক্ষমতা লাভ ও প্রতিষ্ঠা।

- ব্রিটিশ বিরোধী সশস্ত্র প্রতিরোধ আন্দোলন; সংস্কার আন্দোলন ও জাতীয়তাবাদের বিকাশ এবং বাংলার নবজাগরণ; বঙ্গভঙ্গ ও বঙ্গভঙ্গ উত্তরকালে বাংলার রাজনীতি ও দেশ বিভাগ।

- পাকিস্তান আমলে বাংলাদেশ এবং বাংলাদেশের মুক্তি সংগ্রাম ও যুদ্ধ।

**সংস্কৃতি**

সংস্কৃতির সংজ্ঞা, আদিযুগে বাংলার সমাজ-সংস্কৃতির রূপরেখা, সুলতানী, মোঘল ও নবাবী আমলের বাংলার সমাজ সংস্কৃতি; ইংরেজ আমলে বাংলার সমাজ ও সংস্কৃতি।
রবীন্দ্র ও নজরুল যুগ এবং রবীন্দ্র ও নজরুল উত্তর বাংলার সমাজ ও সংস্কৃতি; পাকিস্তান আমলে বাংলাদেশের সাংস্কৃতিক রূপরেখা; স্বাধীনতাউত্তর বাংলাদেশের সংস্কৃতি।

**বিশদ বিবরণী**

**ইতিহাস**

১. ইতিহাসের সংজ্ঞা, প্রাগৈতিহাসিক আমলের বাংলাদেশ এবং বাংলাদেশের আবহাওয়া ও অধিবাসী সম্পর্কে অবগত হওয়া।

    ১.১ ইতিহাসের সংজ্ঞা প্রদান।

    ১.২ বাংলাদেশের প্রাচীন জনপদ উল্লেখ করা।

    ১.৩ বঙ্গ বা বাংলা নামের উৎপত্তি ব্যাখ্যা করা।

    ১.৪ বঙ্গের সীমারেখা চিহ্নিত করা।

    ১.৫ বাংলার আবহাওয়া ও এর অধিবাসীদের চরিত্রে আবহাওয়ার প্রভাব বিবৃত করা।

    ১.৬ প্রাগৈতিহাসিক ও প্রাচীন বাংলার আর্থসামাজিক ব্যবস্থা বর্ণনা করা।

২. বাংলাদেশে গুপ্ত, রাজা শশাঙ্ক, পাল ও মুসলিম শাসন সম্পর্কে অবগত হওয়া।

২.১ গুপ্ত শাসন আমলে বাংলার শাসনব্যবস্থা বর্ণনা করা।

২.২ রাজা শশাঙ্কের রাজ্য বিজয় ও শাসন বর্ণনা করা।

২.৩ বাংলার অরাজকতা ও হিউয়েনসাং এর আমলে বাংলার অবস্থা বর্ণনা করা।

২.৪ গোপাল কর্তৃক অরাজকতার অবসান ঘটানোর কৃতিত্বের বর্ণনা করা।

২.৫ বাংলাদেশে মুসলমানদের আগমন ও বখতিয়ার খলজীর বাংলা বিজয় বর্ণনা করা।

২.৬ বাংলাদেশে স্বাধীন সুলতানী শাসন প্রতিষ্ঠায় শামছুদ্দিন ইলিয়াশ শাঞ্জীর কৃতিত্ব বর্ণনা করা।

২.৭ বাংলায় মোঘল শাসনের ইতিবৃত্ত ব্যাখ্যা করা।

২.৮ ১৭৫৭ সালের পলাশীর যুদ্ধের কারণ, ঘটনা ও ফলাফল বর্ণনা করা।


৩. পলাশীযুদ্ধ পরবর্তী অবস্থায় ইস্ট ইন্ডিয়া কোম্পানীর আধিপত্য বিস্তার সম্পর্কে জ্ঞাত হওয়া।

৩.১ দেওয়ানী, দ্বৈতশাসন ও বাংলার দুর্ভিক্ষ বর্ণনা করা।

৩.২ ইংরেজদের চিরস্থায়ী বন্দোবস্ত এবং এর ফলাফল বর্ণনা করা।

৩.৩ বাংলাদেশে জমিদার, প্রজাব্যবস্থা প্রতিষ্ঠা এবং আর্থ-সামাজিক ব্যবস্থায় জমিদারদের ভূমিকা ও প্রজাকুলের সার্বিক অবস্থা উলেণ্টখ করা।

৩.৪ ১৯০৫ সালের বঙ্গভঙ্গ আন্দোলন ও ফলাফল ব্যখ্যা করা।

৩.৫ হাজী শরীয়ত উলণ্টাহর ফরায়েজী আন্দোলন ও এর ফলাফল ব্যখ্যা করা।


৪. বঙ্গভঙ্গউত্তর রাজনীতি ও দেশ বিভাগ সম্পর্কে অবহিত হওয়া।

৪.১ ১৯৩৭ এর নির্বাচন ও এর বৈশিষ্ট্য উলেণ্টখ করা।

৪.২ লাহোর প্রস্তাব ব্যক্ত করা।

৪.৩ ১৯৪৩ এর বাংলার দুর্ভিক্ষের কারণ ও এর পূর্বাপর অবস্থা উলেণ্টখ করা।

৪.৪ পাকিস্তানের পূর্বাঞ্চল হিসাবে ১৯৪৭ সালে পূর্ব পাকিস্তানের প্রতিষ্ঠা ব্যাখ্যা করা।


৫. পাকিস্তান আমলে বাংলাদেশের (তৎকালীন পূর্ব পাকিস্তান) রাজনীতি, অর্থনীতি ও সামাজিক অবস্থা সম্পর্কে অবগত হওয়া।

৫.১ ভাষা আন্দোলন ও সমকালীন রাজনৈতিক ও সামাজিক প্রেক্ষিত ব্যক্ত করা।

৫.২ আওয়ামীলীগ প্রতিষ্ঠা, যুক্তফ্রন্ট ও ২১ দফা দাবীর ভিত্তিতে নির্বাচন অনুষ্ঠান এবং যুক্তফ্রন্টের মন্ত্রিসভা গঠন ও বাতিল আলোচনা করা।

৫.৩ পাকিস্তানের সামরিক অভ্যুত্থান, আইয়ুব বিরোধী আন্দোলন ও ৬ দফা দাবী, আগরতলা ষড়যন্ত্র মামলার ইতিবৃত্ত বর্ণনা করা এবং পূর্ব-পশ্চিম পাকিস্তানের অর্থনৈতিক বৈষম্যের খতিয়ান উলেণ্টখ করা।

৫.৪ ১৯৬৯ সালের গণঅভ্যুত্থান এবং এর ধারাবাহিকতায় বাংলাদেশের মুক্তিযুদ্ধ ও স্বাধীন সার্বভৌম বাংলাদেশ প্রতিষ্ঠা করার পটভূমি ও ঘটনা প্রবাহ বর্ণনা করা।

৫.৫ ১৯৭১ সালের ঐতিহাসিক মুক্তিযুদ্ধ এবং স্বাধীন সার্বভৌম বাংলাদেশের অভ্যুদয় বর্ণনা করা।


৬. স্বাধীন সার্বভৌম বাংলাদেশের রাজনীতি ও আর্থ-সামাজিক অবস্থা সম্পর্কে অবগত হওয়া।

৬.১ যুদ্ধোত্তর স্বাধীন সার্বভৌম বাংলাদেশের আর্থ-সামাজিক পুনর্গঠন কর্মতৎপরতা বর্ণনা করা।

৬.২ ১৯৭৩ সালের নির্বাচন এবং ১৯৭৪ সালে সংবিধানের ৪র্থ সংশোধনীর মাধ্যমে সরকার পদ্ধতির পরিবর্তন ব্যক্ত করা।

৬.৩ ১৯৭৫ সালের ১৫ আগস্ট জাতির জনক বঙ্গবন্ধু শেখ মুজিবুর রহমান -এর শাহাদাত বরণ এবং রাজনৈতিক পটপরিবর্তন।

৬.৪ ১৯৮১ সালে রাষ্ট্রপতি জিয়াউর রহমানের শাহাদাত বরণ, ১৯৮২ সালের সামরিক অভ্যুত্থান এবং রাজনৈতিক পটভূমি পরিবর্তন।

৬.৫ ১৯৯০ সালে এরশাদ সরকারের পতন এবং তত্ত্বাবধায়ক সরকার পদ্ধতি অনুসংগে ১৯৯১ সনের নির্বাচন এবং গণতান্ত্রিক অনুশীলনের সূচনা।

## সংস্কৃতি

৭. সংস্কৃতির সংজ্ঞা এবং প্রাচীন ও মধ্যযুগীয় বাংলার সংস্কৃতি ও সাহিত্য চর্চা সম্পর্কে অবগত হওয়া।
   ৭.১ সংস্কৃতির সংজ্ঞা দান।
   ৭.২ প্রাচীন বাংলার ভাষা সাহিত্য ও সংস্কৃতির রূপরেখা বর্ণনা করা।
   ৭.৩ বাঙ্গালী সংস্কৃতি নির্মাণে মর্সিয়া ও পুঁথি সাহিত্যের প্রভাব বর্ণনা করা।

৮. আধুনিক যুগে বাংলাদেশের সংস্কৃতি ও বাংলাভাষার আধুনিক রূপলাভ সম্পর্কে অবগত হওয়া।
   ৮.১ ইংরেজ শাসন আমলে সামাজিক কুসংস্কার দূরীকরণে (স্যার সৈয়দ আহমদ, সৈয়দ আমীর আলী ও রাজা রামমোহন রায়) এর আবির্ভাব এবং তাদের কর্মতৎপরতা ব্যাখ্যা করা।
   ৮.২ ক্যারি সাহেব এবং ফোর্ট উইলিয়াম কলেজ/সংস্কৃত কলেজ স্থাপনের মাধ্যমে বাংলার নতুন সংস্কৃতির রূপলাভ বর্ণনা করা।
   ৮.৩ ইংরেজদের শিক্ষানীতি প্রবর্তন ব্যাখ্যা করা এবং কলিকাতা বিশ্ববিদ্যালয় ও ইসলামিয়া মাদ্রাসা স্থাপনের মাধ্যমে বাংলার সংস্কৃতির বিকাশ ব্যক্ত করা।
   ৮.৪ ঢাকা বিশ্ববিদ্যালয় প্রতিষ্ঠার ইতিবৃত্ত ব্যাখ্যা করা।

৯. ১৯৪৭ এর দেশ বিভাগ ও সাংস্কৃতিক অবস্থার পরিবর্তন সম্পর্কে অবগত হওয়া।
   ৯.১ তৎকালীন পূর্ব পাকিস্তানের তমুদ্দুন মজলিসের ভূমিকা উল্লেখ করা।
   ৯.২ ১৯৫২ সালের ভাষা আন্দোলনের সাংস্কৃতিক গুরুত্ব উল্লেখ করা।
   ৯.৩ ঢাকা কেন্দ্রিক শিল্পী-সাহিত্যিকদের বাংগালী সংস্কৃতি বিনির্মাণের ভূমিকা পালন উল্লেখ করা।
   ৯.৪ '৬৯ এর গণ আন্দোলনে সাংস্কৃতিক কর্মীদের ভূমিকা উল্লেখ করা।
   ৯.৫ বাঙলা একাডেমীর প্রতিষ্ঠা এবং বাংলা ভাষা ও সাহিত্যে এর ভূমিকা উল্লেখ করা।
   ৯.৬ আন্তর্জাতিক মাতৃভাষা দিবস হিসেবে ২১ ফেব্রুয়ারির তাৎপর্য ব্যক্ত করা।
   ৯.৭ ভাষা, শিল্প সাহিত্য চর্চায় সংবাদপত্র ও ইলেক্ট্রনিক মিডিয়ার ভূমিকা উল্লেখ করা।

১০. সংস্কৃতির উপর গ্রামীণ অর্থনীতির প্রভাব অবগত হওয়া।
   ১০.১ তাঁত শিল্প ও মসলিন উৎপাদনের ইতিবৃত্ত ব্যাখ্যা করা।
   ১০.২ পাট চাষের অর্থনৈতিক প্রভাব ব্যক্ত করা।
   ১০.৩ বাঙ্গালী সংস্কৃতির অংশ হিসেবে দুগ্ধজাত মিষ্টান্ন সামগ্রীর (মিষ্টি, মাখন, দধি, পিঠা-পুলি প্রভৃতি) প্রভাব ব্যক্ত করা।
   ১০.৪ দেশীয় মেলা ও পার্বনের সাংস্কৃতিক গুরুত্ব ব্যাখ্যা করা।
   ১০.৫ গ্রামীণ পেশাজীবিদের (কামার, কুমার, তাঁতী, জেলে, ছুতার, ইত্যাদি) সাংস্কৃতিক গুরুত্ব ব্যাখ্যা করা।

১১. বাংলাদেশের সংস্কৃতিতে আদিবাসী সংস্কৃতি ও প্রত্ন তাত্ত্বিক নিদর্শনের অবদান সম্পর্কে অবগত হওয়া।
   ১১.১ বাংলাদেশের আদিবাসী সম্পর্কে উল্লেখ করা।
   ১১.২ বাংলাদেশের সংস্কৃতিতে গাড়ো, রাখাইন, সাওতাল, চাকমা আদিবাসীদের সংস্কৃতিক অবদান ব্যখ্যা করা।
   ১১.৩ বাংলাদেশের প্রাচীন সংস্কৃতির ঐতিহ্য হিসাবে মহাস্থানগড়, ময়নামতি ও পাহাড়পুরের প্রত্নতাত্ত্বিক নিদর্শনের বর্ণনা দান।

*সহায়ক পুস্তক*

রহিম, চৌধুরী, মাহমুদ ও ইসলাম, "বাংলাদেশের ইতিহাস (পরিবর্ধিত ও পরিমার্জিত)" ; নওরোজ কিতাবিস্তান, আগস্ট,
        ১৯৯৯ ।

কে, আলী "বাংলাদেশের ইতিহাস"; আজিজিয়া বুক ডিপো, ২০০১ ।

সিরাজুল ইসলাম, "বাংলাদেশের ইতিহাস-১৭০৪-১৯৭১"; ১ম, ২য় ও ৩য় খণ্ড;
        বাংলাদেশ এশিয়াটিক সোসাইটি, ফেব্রুয়ারি ২০০০ ।

কো-আন্তোনভা, প্রি, কতোভঙ্কি, "ভারতবর্ষের ইতিহাস"; প্রগতি প্রকাশন, ১৯৮৮ ।

গোপাল হালদার; "সংস্কৃতির রূপান্তর"; মুক্তধারা, মে ১৯৮৪ ।

মোতাহের হোসেন চৌধুরী, "সংস্কৃতি কথা"; নওরোজ কিতাবিস্তান, জানুয়ারি ১৯৯৮ ।

গোপাল হালদার, "বাংলা সাহিত্যের রূপরেখা-১ম ও ২য় খণ্ড"; মুক্তধারা, জুলাই ১৯৭৮ ।