

Roll No.

Total Pages : 3

NBCA/M-26

37501

OBJECT ORIENTED PROGRAMMING USING C++

Paper-B23-CAP-201

(BCA) (CCA2)

Time : Three Hours]

[Maximum Marks : 50

Note : Question No. 1 is compulsory. Attempt any *four* questions out of units I, II, III & IV by selecting atleast *one* question from each unit. All questions carry equal marks.

Compulsory Question

1. (a) Define streams in C++
(b) What is inline function?
(c) Differentiate between pointer and reference.
(d) What is abstraction?
(e) Write short note on Static data members.
(f) Write Syntax for Copy constructor.
(g) Differentiate between Unary vs. Binary operators.
(h) Define Virtual base class.
(i) What are uncaught exceptions?
(j) Explain Divide by zero error. (1×10=10)

UNIT-I

2. (a) Explain how overloaded shift operator and member functions are used for Input-Output Operations in C++? 05

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28/5

- (b) Write a program in C++ to calculate the area of circle, rectangle and triangle using function overloading. 05
3. (a) Explain the concept of structure and union in C++. Also differentiate them with the help of proper example. 05
- (b) Write a program to demonstrate the use of cascaded insertion and extraction operators in C++. 05

UNIT-II

4. What do you mean by the data members and member functions of a class? Explain how you can define a member function outside a class by taking example? 10
5. (a) What do you mean by copy constructor in C++? What are different situations in which copy constructor is applicable? 05
- (b) Define Scope resolution operator in C++. Also list its uses using suitable examples. 05

UNIT-III

6. (a) What do you mean by Operator Overloading? Which operators in C++ cannot be overloaded? Write syntax to overload binary operator with friend function. 05
- (b) Explain how can you manipulate string using operators in C++. 05
7. (a) What do you mean by abstract keyword in C++? Explain why abstract classes are used in C++. 05
- (b) Write a program to differentiate and demonstrating multiple and multilevel inheritance techniques in C++. 05

UNIT-IV

8. (a) Explain virtual function in C++. How it differs from Pure Virtual function? 05
- (b) Write a program to demonstrate use of Catch All in Exception Handling. 05
9. (a) Explain nested try block in Exception Handling. Discuss the order in which exception handling mechanism takes place in C++. Demonstrate by example. 05
- (b) What are different type of polymorphism in C++? Explain with the help of proper example. 05
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Roll No.

Total Pages : 3

37502

NBCA/M-26

INTRODUCTION TO WEB TECHNOLOGIES

Paper : B23-CAP-202

(BCA) (CC-B2)

Time : Three Hours]

[Maximum Marks : 50

Note : Question No. 1 is compulsory. Attempt any *four* questions out of units I, II, III & IV by selecting atleast *one* question from each unit. All questions carry equal marks.

Compulsory Question

1. (a) Define ® © named entities in HTML.
- (b) What is a URL?
- (c) What is a web browser? Name any two.
- (d) Define two Empty Tags.
- (e) Explain <pre> tag.
- (f) What is JavaScript?
- (g) Explain Priority of Inline, Internal and External CSS.
- (h) Using which tag and attribute you can change background colour of a web page?
- (i) Differentiate between == and === in java script.
- (j) Explain let, var and const in java script. (1×10=10)

UNIT-I

2. (a) Define the term WWW. Explain the evolution and history of the WWW. (5)
- (b) What do you mean by web client? Explain common types of Web Clients? (5)
3. Before designing a website is it necessary to plan a website Justify your answer. Explain what steps are carried out during website planning process? (10)

UNIT-II

4. Explain basic Structure of HTML document. Also explain various block level elements and associated attributes with examples.
5. (a) Design a simple Student Registration Form for University using various fields of <form> tag in HTML. (5)
- (b) Explain Ordered and Unordered List in HTML. (5)

UNIT-III

6. What do you mean by CSS? Explain various types of CSS and their syntax with examples. (10)
7. Discuss CSS Box Model using suitable example. How browser determines element appearance using CSS Box model. (10)

UNIT-IV

8. Explain the features and applications of Java-Script. How Java-Script is used to validate the data? (10)
9. Differentiate between static and dynamic web pages with examples. Which type of web pages are more interactive? (10)
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Roll No.

Total Pages : 3

37503

NBCA/M-26

CONCEPTS OF OPERATING SYSTEMS

Paper : B23- CAP-203

(CC-C2)

(BCA)

Time : Three Hours]

[Maximum Marks : 50

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

Compulsory Question

1. Attempt all *five* questions :

- (a) Define the real time operating system.
- (b) What is thread? How it is different from Process?
- (c) What is Semaphore?
- (d) What is Swapping?
- (e) Define Seek Time. (5×2=10)

UNIT-I

2. Explain Operating System Structure and compare Monolithic and Microkernel approaches. (10)

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3. (a) What is Process Control Block? Explain different types of components of PCB. (5)
- (b) Explain inter process communication with different methods. (5)

UNIT-II

4. Explain CPU Scheduling criteria and different levels of scheduling. (10)
5. (a) What is Deadlock? Discuss different necessary conditions of deadlock. (5)
- (b) Explain how semaphores is used to solve synchronization problem? (5)

UNIT-III

6. Differentiate the following :
- (a) Fixed and Variable Partitioning.
- (b) Paging and Segmentation. (5×2=10)
7. Consider the following reference string :
- 1, 2, 3, 4, 2, 1, 6, 5, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.
- How many page fault occur for :
- (i) LRU Replacement.
- (ii) FIFO Replacement.

Note : Initially all frames are empty. Best to assume 4 frames. (10)

UNIT-IV

8. (a) Explain Directory Structures with advantages and disadvantages. (5)
- (b) Explain different techniques of Free Space Management. (5)
9. What is Disk Scheduling? Describe the LOOK and C-LOOK algorithms with Example. (10)
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Roll No.

Total Pages : 2

18067

NBCA/M-26

DATA STRUCTURES AND APPLICATIONS

Paper : B23-CDS-401

Time : Three Hours]

[Maximum Marks : 50

Note : Attempt *five* questions in all, selecting at least *one* question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

Compulsory Question

1. Give short answers to the following questions :

- What is the difference between linear and nonlinear data structures?
- What is pattern matching in strings?
- Write the formula to find the memory address of the i -th element in a one-dimensional array.
- What is recursion? Give one example of its application in data structures.
- Name any two sorting algorithms and mention their average-case time complexity.

UNIT-I

2. Explain the concept of Data Structure along with its classification and operations.

3. What is Array? Describe types of arrays and code examples for creation and traversal of such arrays.

UNIT-II

4. Explain pattern matching in strings.
5. Compare and contrast arrays and linked lists.

UNIT-III

6. Explain infix to postfix expression conversion with an example.
7. Define queue and briefly discuss the types and applications of queues in computer science.

UNIT-IV

8. Differentiate between preorder, inorder, and postorder tree traversals.
 9. Write an algorithm for binary search. Analyze its time complexity.
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Roll No.

Total Pages : 2

18068

NBCA/M-26

INTRODUCTION TO BIG DATA

Paper : B23-CDS-402

Time : Three Hours]

[Maximum Marks : 50

Note : Attempt *five* questions in all by selecting *one* question from each unit. Question number 1 is compulsory. All questions carry equal marks.

Compulsory Question

1. Write short notes on the following :
 - (a) Velocity and Veracity w.r.t. Big Data.
 - (b) Apache Spark.
 - (c) Processing of Data for Analytics.
 - (d) Data Protection in Big Data.

UNIT-I

2. What do you mean by Big Data? How is it different from traditional data? Explain using suitable examples.
3. Explain the MapReduce Programming Model with the help of the wordcount example for Mappers and Reducers.

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390

UNIT-II

4. Explain the following with suitable examples :
NoSQL Databases, Data Ingestion.
5. (a) What do you mean by architecture of Big Data systems?
(b) How does Extract, Transform and Load work in Big Data?

UNIT-III

6. What are Batch Processing and Real-Time Processing of Data?
7. (a) Explain the Descriptive Data Analytic techniques in detail.
(b) Why visualization technique e.g. Tableau is needed?

UNIT-IV

8. (a) What do you mean by Privacy concerns w.r.t. BigData?
(b) Explain the encryption techniques with suitable examples.
 9. What are the data protection laws in Big Data? Explain using suitable examples.
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18069**NBCA/M-26****ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS****Paper : B23-CDS-403****Time : Three Hours]****[Maximum Marks : 50**

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

Compulsory Question

1. (a) What is heuristic function? Illustrate.
- (b) What are the assumptions behind the Minimax algorithm?
- (c) How do ontologies support knowledge sharing and reuse?
- (d) What is knowledge engineering and why is it crucial for expert systems?

UNIT-I

2. (a) Define Artificial Intelligence. What are its important applications?
- (b) Write the algorithm of Breadth First Search and discuss its time and space complexities.

3. (a) What are the desirable characteristics of a search technique? Discuss.
- (b) Write the A* algorithm and discuss its properties.

UNIT-II

4. (a) Write the pseudocode for the Minimax algorithm. How does the depth of a game tree impact the Minimax algorithm's performance?
- (b) Differentiate between universal and existential quantifiers using suitable examples.
5. (a) How does Alpha-Beta Pruning improve the performance of the Minimax algorithm? Illustrate.
- (b) What is Robinson's resolution principle? Discuss.

UNIT-III

6. (a) Define Expert System. Discuss its different components using a block diagram.
- (b) What are the different techniques of knowledge acquisition? Discuss.
7. (a) Why rule-based architecture in Expert System is a preferred architecture? Discuss.
- (b) What are the different applications of Expert Systems? Discuss.

UNIT-IV

8. (a) Explain the importance of explainability and interpretability in expert systems.
- (b) What is algorithmic bias, and how can it arise in AI systems?
9. (a) What role does data diversity play in ensuring fair AI outcomes?
- (b) What are the long-term risks and benefits of widespread AI adoption in society?
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Roll No.

Total Pages : 3

NPAV/M-26

24846

DATA HANDLING

Paper-B23-VOC-221

Time Allowed : 3 Hours]

[Maximum Marks : 50

Note : Attempt **five** questions in all, selecting **one** question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

Compulsory Question

1. Write short notes on the following : 5×2=10

- (a) Define time series data with an example.
- (b) Differentiate between correlation and regression.
- (c) Explain the difference between one-tailed and two-tailed tests.
- (d) What are the assumptions of the t-distribution?
- (e) Distinguish between independent t-test and paired t-test.

UNIT-I

2. (a) What are the advantages and limitations of using graphical methods for Data presentation? 5

- (b) Explain the various types of Data based on measurement scales with suitable examples. 5
3. (a) Explain in detail the construction and interpretation of frequency distribution and cumulative frequency distribution with suitable examples. 5
- (b) Elaborate on the sources and methods of Data collection. How does the nature of the Data influence the method used? 5

UNIT-II

4. Explain different measures of dispersion with formulas and examples : quartile deviation, mean deviation, variance and standard deviation. 10
5. (a) A data analyst wants to compare variability in two series.

Series A : Mean = 50, Standard Deviation = 5

Series B : Mean = 80, Standard Deviation = 12

Calculate the coefficient of variation for both and interpret the result. 5

- (b) Calculate the mean, median, and mode for the following data : 5

Marks: 10, 20, 30, 40, 50

UNIT-III

6. Define and explain the following with examples: (i) Null and alternative hypotheses (ii) Type I and Type II errors (iii) Level of significance and power of a test (iv) Critical region and p-value. 10
7. (a) Two samples have means 45 and 50, standard deviations 5 and 6 and sample sizes 30 and 40 respectively. Test whether the difference in means is significant at 5% level. 5
- (b) A coin is tossed 500 times and heads appear 260 times. Test whether the coin is fair at 5% significance level. 5

UNIT-IV

8. (a) Explain the use of the Chi-square test for testing independence of attributes with steps. 5
- (b) A sample of 25 students has a mean score of 68 with a standard deviation of 10. Test the hypothesis that the true mean is 65 at the 5% level of significance. 5
9. Test the equality of variances using F-test : 10
- Sample A : $n_1 = 12, s_1^2 = 20$
 - Sample B : $n_2 = 10, s_2^2 = 10$.

Use a 5% level of significance and determine whether the assumption of equal variances holds.

BAQ/M-26 14310

MOBILE APP DESIGNING

Time : Three Hours]

[Maximum Marks : 50

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks.

प्रत्येक इकाई से एक प्रश्न चुनते हुए, कुल पाँच प्रश्नों के उत्तर दीजिए । प्रश्न संख्या 1 अनिवार्य है । सभी प्रश्नों के अंक समान हैं ।

Compulsory Question (अनिवार्य प्रश्न)

1. (a) List all major Android versions.

सभी प्रमुख एंड्रॉइड संस्करणों की सूची बनाइये ।

- (b) Explain the concept of measurements in Android.

एंड्रॉइड में माप की अवधारणा की व्याख्या कीजिए ।

- (c) What are Broadcast Receivers in Android ?

एंड्रॉइड में ब्रॉडकास्ट रिसीवर क्या हैं ?

(d) What is the role of the View.OnClickListener interface in event handling ?

इवेंट हैंडलिंग में View.OnClickListener इंटरफेस की भूमिका क्या है ?

(e) Describe the role of SQLiteOpenHelper ? $5 \times 2 = 10$
SQLiteOpenHelper की भूमिका का वर्णन कीजिए ।

Unit I (इकाई I)

2. Differentiate mobile application models and web applications in terms of architecture. 10

आर्किटेक्चर के संदर्भ में मोबाइल एप्लिकेशन मॉडल और वेब एप्लिकेशन के बीच अंतर बताइये ।

3. What is the Android Virtual Device (AVD) Manager ?
How to create and configure a virtual device ? 10

एंड्रॉइड वर्चुअल डिवाइस (AVD) मैनेजर क्या है ? एक वर्चुअल डिवाइस कैसे बनाएँगे और कॉन्फिगर करेंगे ।

Unit II (इकाई II)

4. Explain the working and structure of GridLayout in Android. How does it differ from TableLayout ? 10

एंड्रॉइड में GridLayout की कार्यप्रणाली और संरचना की व्याख्या कीजिए । यह TableLayout से कैसे भिन्न है ?

5. (a) Differentiate between px, dp, sp, in, and mm units in Android UI design. 5

एंड्रॉइड UI डिजाइन में px, dp, sp, in, और mm इकाइयों के बीच अंतर बताइये ।

- (b) Explain the use and behavior of CheckBoxes in Android. 5

एंड्रॉइड में CheckBoxes के उपयोग और व्यवहार की व्याख्या कीजिए ।

Unit III (इकाई III)

6. Differentiate between explicit and implicit intents in Android. Explain with example. 10

एंड्रॉइड में स्पष्ट और अंतर्निहित इरादों के बीच अंतर बताइये । उदाहरण सहित व्याख्या कीजिए ।

7. What is application signing in Android ? Why is it essential before publishing an app ? 10

एंड्रॉइड में एप्लिकेशन साइनिंग क्या है ? ऐप प्रकाशित करने से पहले यह क्यों आवश्यक है ?

Unit IV (इकाई IV)

8. Describe the complete life-cycle of a Fragment. How does it differ from the life-cycle of an Activity ? 10

एक फ्रैगमेंट के पूर्ण जीवन-चक्र का वर्णन कीजिए । यह एक गतिविधि के जीवन-चक्र से कैसे भिन्न है ?

9. What is SQLite in Android ? Discuss its features and advantages for mobile application development. 10

एंड्रॉइड में SQLite क्या है ? इसकी विशेषताओं और मोबाइल एप्लिकेशन विकास के लिए फायदों पर चर्चा कीजिए ।



Roll No.

Total Pages : 3

18073

NBCA/M-26

DATA VISUALIZATION

Paper : B23-CDS-601

(BCA-DS)

Time : Three Hours]

[Maximum Marks : 70

Note : Attempt *five* questions in all, selecting *one* question from each Unit-I to Unit-IV. Question No. 1 is compulsory. All questions carry equal marks.

Compulsory Question

1. (a) Define data visualization.
- (b) State any two principles of effective data visualization.
- (c) Name any two types of data visualization.
- (d) What is data filtering in visualization?
- (e) What is a violin plots?
- (f) What is a dashboard in data visualization?
- (g) What is data storytelling? (7×2=14)

UNIT-I

2. (a) Explain the importance of data visualization and its key principles. (7)
- (b) Describe the data visualization process with suitable examples. (7)

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61

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20/5

3. (a) Discuss different types of data visualization such as charts, graphs, and maps. (7)
- (b) Explain ethical considerations and best practices in data visualization. (7)

UNIT-II

4. (a) Explain basic data visualization tools such as Excel, Google Sheets, and Tableau Public. (7)
- (b) Describe the steps to create and customize charts like bar chart and pie chart. (7)
5. (a) Explain the use of labels, titles, legends, and annotations in visualization. (7)
- (b) Discuss data filtering, sorting, and exporting techniques in visualization tools. (7)

UNIT-III

6. (a) Explain advanced visualization libraries such as Matplotlib, Seaborn, and Plotly. (7)
- (b) Describe the creation of complex visualizations like heatmaps, histograms, and box plots. (7)
7. (a) Explain geographic visualization and choropleth maps. (7)
- (b) Discuss dashboard creation and customization in data visualization. (7)

UNIT-IV

8. (a) Explain how to choose the right visualization for different data types and goals. (7)
- (b) Discuss design principles such as colour theory, layout, and typography. (7)
9. (a) Explain the concept of data storytelling with examples. (7)
- (b) Discuss accessibility, inclusivity, and evaluation of data visualizations. (7)
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Roll No.

Total Pages : 2

18074

NBCA/M-26

INTERNET OF THINGS

Paper : B23-CDS-602

Time : Three Hours]

[Maximum Marks : 50

Note : A candidate is required to answer *five* questions in all, selecting *one* question from each unit in addition to Compulsory Question No. 1. All questions carry equal marks.

Compulsory Question

1. (a) Write short note on IoT enabling technologies. (2)
- (b) Describe IoT levels and deployment templates with examples. (2)
- (c) Discuss domain-specific IoT applications in smart cities, healthcare, and agriculture. (2)
- (d) Describe MQTT protocol and its working mechanism. (2)
- (e) Explain the concept of reading and writing data using Python. (2)

UNIT-I

2. Explain the architecture of IoT with its functional blocks and communication models. (10)

18074/50/555/1153

311

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22/5

3. Describe IoT communication protocols and APIs with examples. (10)

UNIT-II

4. Describe a complete IoT system for smart home automation with diagram. (10)
5. Discuss the working of sensors, actuators, and gateways in IoT systems. (10)

UNIT-III

6. Differentiate between IoT and M2M communication with advantages and limitations. (10)
7. What is service discovery in IoT? Explain mDNS with example. (10)

UNIT-IV

8. Explain how to build a simple IoT application using Python, including APIs and JSON handling? (10)
9. Describe GPIO programming in Raspberry Pi using Python. (10)
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Roll No.

Total Pages : 2

18075

NBCA/M-26

BASICS OF NEURAL NETWORK AND DEEP LEARNING

Paper : B23-CDS-603

(BCA-DS)

Time : Three Hours]

[Maximum Marks : 50

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is compulsory.

Compulsory Question

1. (i) Define Artificial Intelligence.
- (ii) What is forward propagation?
- (iii) Discuss the role of Python libraries in Deep Learning.
- (iv) Discuss types of pooling operations.
- (v) What is digit recognition problem? (5×2=10)

UNIT-I

2. Compare Biological Neurons and Artificial Neurons. Explain their structure and functioning with a diagram. 10
3. What is a Multilayer Perceptron (MLP)? Explain its architecture and advantages over a single-layer perceptron. 10

UNIT-II

4. What do you mean by overfitting? Explain some techniques to avoid overfitting. Can there be underfitting in a model? 10

18075/50/555/1235

344 [P.T.O.
25/5

5. (i) Explain how model is evaluated using accuracy, loss, and other metrics? 5
- (ii) Write a short note on TensorFlow and Keras APIs. 5

UNIT-III

6. Explain convolution operation in CNN with a suitable example. 10
7. (i) Describe real-life applications of CNN and RNN. 5
- (ii) Explain the basic architecture of a Convolutional Neural Network. 5

UNIT-IV

8. Write short notes on :
- (i) Bias in AI.
- (ii) Explainability in AI. 10
9. (i) Elaborate ethical concerns in deep learning with example. 5
- (ii) Discuss the role of autoencoders in anomaly detection. 5
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18076**NBCA/M-26****DESIGN AND INNOVATION THINKING**

Paper : B23-CDS-604

(DS) (BCA)

Time : Three Hours]

[Maximum Marks : 50

Note : Question No. 1 is compulsory. In addition to that, attempt *four* more questions selecting *one* question from each unit. All questions carry equal marks.

Compulsory Question

1. (a) Discuss the importance of customer-centricity in Design Thinking. (2.5)
- (b) Why empathy is considered the foundation of Design Thinking? Explain. (2.5)
- (c) Analyze the relationship between ideation, prototyping, and implementation. (2.5)
- (d) Discuss how continuous feedback improves product design and innovation? (2.5)

UNIT-I

2. (a) What is Design Thinking? Explain its objectives. Discuss how it differs from traditional problem-solving approaches? (5)
- (b) Explain how Design Thinking enhances customer experience? (5)

18076/50/555/1440

388 [P.T.O.
28/5

3. Explain the different stages of the Design Thinking process with examples. (10)

UNIT-II

4. (a) Discuss the importance of observation and information assimilation in understanding user needs. How do these skills contribute to effective problem definition? (5)
- (b) Explain the concept of individual differences and uniqueness. How does recognizing diversity improve the design process? (5)
5. (a) What are wicked problems? Explain their characteristics and why they are difficult to define and solve? (5)
- (b) Analyze the importance of understanding and appreciating individual differences in problem-solving. How does it lead to more inclusive and innovative solutions? (5)

UNIT-III

6. Explain the ideation phase in Design Thinking and discuss brainstorming, mind mapping, and systems thinking with suitable examples. (10)
7. (a) Explain the concept of prototyping in Design Thinking and describe various methods of prototyping. (5)
- (b) Explain the implementation phase in Design Thinking. (5)

UNIT-IV

8. (a) Discuss the importance of user experience in the re-design process. (5)
- (b) What is user-focused design? Explain its principles and how it ensures that products meet user needs and expectations? (5)
9. (a) Explain the importance of final concept testing. Discuss methods used to evaluate the effectiveness and feasibility of a design solution. (6)
- (b) Explain how iterative design supports re-creation of better solutions? (4)
-