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UNIVERSITY OF NORTH BENGAL

B.Sc. Major 4th Semester Examination, 2026

COMSMAJ407-COMPUTER SCIENCE

OPERATING SYSTEM

Time Allotted: 2 Hours 30 Minutes

Full Marks: 60

The figures in the margin indicate full marks.

GROUP-A

Answer any four questions

3×4 = 12

1. What is Kernel?
2. Define process control block (PCB).
3. Define semaphore and critical section.
4. Discuss paging.
5. What is a thread?
6. Define starvation.

GROUP-B

Answer any four questions

6×4 = 24

7. Explain CPU scheduling.
8. Draw and explain the process state diagram.
9. Differentiate between multitasking and multiprogramming.
10. Explain SJF scheduling.
11. What is physical and virtual address space?
12. Explain time sharing system.

GROUP-C

Answer any two questions

12×2 = 24

13. Explain memory allocation strategies in detail.
14. What is segmentation? Explain in detail.
15. Explain Banker's algorithm with example.
16. What is a deadlock? Explain the necessary and sufficient conditions for a deadlock in detail.

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B.Sc. Major 4th Semester Examination, 2026

COMSMAJ408-COMPUTER SCIENCE

DATA STRUCTURE

Time Allotted: 2 Hours 30 Minutes

Full Marks: 60

The figures in the margin indicate full marks.

GROUP-A

Answer any four questions

3×4 = 12

1. What is the time complexity of linear search and binary search?
2. Write the output of the stack operations:
Push(5), Push(10), Pop();
Push(15), Push(20), Pop(), Push(25)
3. Discuss an algorithm for insertion of an element into an array.
4. Calculate the maximum number of nodes in a binary tree with height = 2.
5. What is a circular linked list? Explain.
6. Discuss the nature of a stack and a queue.

GROUP-B

Answer any four questions

6×4 = 24

7. Define the following:
(a) Complete Binary tree
(b) Full or Strict Binary tree
(c) Skewed binary tree.
8. Write an algorithm for insertion of an element at the beginning of a singly linked list.
9. Evaluate the following arithmetic expression P, written in postfix notation, using a stack.
$$P : 5, 6, 2, +, *, 12, 4, /, -$$
10. Explain selection sort with the help of an example.
11. Discuss Queues, explaining the problem faced by a simple queue and a solution to the problem.

12. What is a Binary search tree? Construct a BST from:
50, 30, 70, 20, 40, 60, 80.

GROUP-C**Answer any two questions****12×2 = 24**

13. Discuss the advantages of array over a linked list and linked list over an array.
14. Write an algorithm for deletion of an element from a doubly linked list.
15. With the help of an example discuss the three different tree traversal algorithms.
16. Convert the infix expression into postfix and prefix

$$a + b * c / d \uparrow e \uparrow f * a - b / c.$$

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UNIVERSITY OF NORTH BENGAL

BCA Major 4th Semester Examination, 2026

BCAPMAJ407-BACHELOR OF COMPUTER APPLICATION

DISCRETE MATHEMATICS

Time Allotted: 2 Hours 30 Minutes

Full Marks: 60

The figures in the margin indicate full marks.

GROUP-A

Answer any four questions

3×4 = 12

1. Construct the truth table for the proposition $(P \rightarrow Q) \leftrightarrow (\neg Q \rightarrow \neg P)$.
2. What are set identities?
3. Explain Domain and Range.
4. Define floor and ceiling functions.
5. Define equivalence relation and provide an example.
6. What is binary relation? Give the Binary representation graphically and in tabular form.

GROUP-B

Answer any four questions

6×4 = 24

7. State the Pigeonhole Principle in your own words and provide an example to illustrate its application.
8. Prove that $1+3+5+\dots+(2n-1)=n^2$ for all positive integers n , by using mathematical induction.
9. Explain Big Theta notation with suitable example.
10. Let a_n be the sequence that satisfies the recurrence relation $a_n = a_{n-1} + 6$ for $n \geq 1$.
 (i) If $a_0 = 3$, find a_1, a_2, a_3
 (ii) If $a_0 = -7$ find a_1, a_2, a_3
11. If we have two group with people, 4 in each group from a total of 12 people. What are the number of ways the grouping can be formed?
12. Explain well formed formula.

GROUP-C

Answer any *two* questions

12×2 = 24

- 13.(a) Determine whether the following compound proposition is a tautology:

$$(p \wedge q) \vee (\neg p \wedge \neg q)$$

- (b) Use De Morgan's laws to rewrite the expression $\neg(p \wedge \neg q)$ in terms of negations of $\neg p$ and $\neg q$.

14. Discuss the properties of binary relation with suitable examples.

15. Make the truth table of the following:

(a) $(X \leftrightarrow Y) \leftrightarrow (X \wedge Y) \vee (\neg X \wedge \neg Y)$

(b) $(X \oplus Y) \leftrightarrow (X \wedge \neg Y) \vee (\neg X \wedge Y)$

16. Prove that if f_n is a Fibonacci number, then:

$$f_n = \frac{1}{\sqrt{5}} \left[\left(\frac{1+\sqrt{5}}{2} \right)^{n+1} - \left(\frac{1-\sqrt{5}}{2} \right)^{n+1} \right] \text{ for all } n \in N.$$

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BCAPMAJ408-BACHELOR OF COMPUTER APPLICATION

DATA STRUCTURE

Time Allotted: 2 Hours 30 Minutes

Full Marks: 60

The figures in the margin indicate full marks.

GROUP-A

Answer any four questions

3×4 = 12

1. “Stack is called a LIFO structure”. Explain.
2. Discuss briefly the Polish and the Reverse Polish notations.
3. Find the maximum number of nodes in a binary tree with height = 3.
4. Name the different linear data structures that are available.
5. Define an AVL tree. Give an example.
6. What is degree of a node, degree of a tree, height of a node and height of a tree?

GROUP-B

Answer any four questions

6×4 = 24

7. Differentiate between linear search and binary search.
8. Write algorithms for PUSH and POP operations in a stack.
9. What is a general tree? How can you convert a general tree to a binary tree? Explain with an example.
10. Define a Queue. What is the problem that is faced with a simple queue? How can the problem be overcome? Explain.
11. Sort the array using any sorting technique and show all the passes.

8, 3, 5, 2, 9

12. Construct a binary search tree by inserting the following sequence of numbers.

10, 12, 5, 4, 20, 8, 7, 15, 13

GROUP-C

Answer any two questions

12×2 = 24

13. Write down an algorithm for insertion of an element into a circular queue. Also explain the algorithm.
14. Explain the steps for conversion of an infix expression to postfix.
Convert: $P + (Q - R) * T$ into postfix.
15. Write down an algorithm for deletion of an element from a singly linked list. Also explain with the help of a diagram.
16. Discuss inorder, preorder and postorder traversal of a binary tree, with the help of an example.

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BCA Major 4th Semester Examination, 2026

UBCAMA J24007-BACHELOR OF COMPUTER APPLICATION

SOFTWARE ENGINEERING

Time Allotted: 2 Hours 30 Minutes

Full Marks: 60

The figures in the margin indicate full marks.

GROUP-A

Answer any four questions

3×4 = 12

1. Define software and software engineering.
2. What is SDLC? List its phases.
3. What is Software Requirement Specification (SRS)?
4. What is Software Project Management?
5. What is ISO 9000 Certification?
6. Define verification and validation.

GROUP-B

Answer any four questions

6×4 = 24

7. Explain the changing nature of software.
8. Explain the characteristics of a good SRS document.
9. Explain the different levels of CMMI.
10. Explain fact-finding techniques in requirement gathering.
11. Explain the prototype model with neat diagram and with suitable example.
12. Compare Black-box and White-box testing techniques.

GROUP-C

Answer any two questions

12×2 = 24

13. Explain the Waterfall model for software development process and discuss various activities in each phase.
14. Explain the Risk Management process and RMMM plan in detail.
15. Explain DFD and ERD with suitable diagrams, draw and label the standard symbols for DFD and ERD.
16. What is Software quality? Discuss Software Quality Assurance and Quality Control with suitable example.

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UNIVERSITY OF NORTH BENGAL

BCA Major 4th Semester Examination, 2026

UBCAMA J24008-BACHELOR OF COMPUTER APPLICATION

PROGRAMMING IN JAVA

Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks.

GROUP-A

Answer any five questions

1×5 = 5

1. Name any two primitive datatypes in Java.
2. What is a constructor?
3. What is bytecode in Java?
4. Which class is used for input from keyboard in Java?
5. What is an exception?
6. What is inheritance?
7. What is an applet?
8. What is an array?

GROUP-B

Answer any three questions

5×3 = 15

9. Explain constructor overloading with suitable example.
10. Explain the features of Java.
11. Explain abstract class in Java with suitable example.
12. Explain different types of operators in Java with examples.
13. Differentiate between “==” operator and .equals() method in Java Strings.

GROUP-C

Answer any two of the following

10×2 = 20

14. Explain Java architecture. Discuss differences between C and Java with suitable examples.
15. Explain Object Oriented Programming Principles in Java. Describe classes, objects, constructors and garbage collection.
16. What are strings in Java? Explain string class methods with examples.
17. Discuss decision making statements and looping constructs in Java with syntax and examples.

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