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সম্মান মন্ত্র: সধিতা: সমানী

UNIVERSITY OF NORTH BENGAL
B.Sc. Major 2nd Semester Examination, 2026

North Bengal St. Xavier's College
Library
Rajshahi, Post Box No.-1
Pin- 735134, Dist - Jalpaiguri

COMSMAJ203-COMPUTER SCIENCE**DISCRETE STRUCTURES**

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

- Construct the truth table for the proposition
 $(P \vee Q) \wedge (Q \vee R)$
- What are set identities?
- Prove that the number of vertices of odd degree in a graph is always even.
- Let $A = \{1, 2, 3, 4, 5, 6, 7\}$ and a relation R defined as $R = \{\{x, y\} / |x - y| = 2\}$.
- What is binary relation? Show it graphically and in tabular form.
- What are domain and range?

GROUP-B**Answer any four questions**

6×4 = 24

- State the Pigeonhole Principle in your own words and provide an example to illustrate its application.
- State and explain Euler Paths with example.
- Show that a tree T with ' n ' vertices has $(n-1)$ edges.
- State and explain Big Theta notation with suitable example.
- Let a_n be the sequence that satisfies the recurrence relation.
$$a_n = a_{n-1} + 8 \quad \text{for } n \geq 1$$
 - If $a_0 = 4$, find a_1, a_2, a_3 .
 - If $a_0 = -6$, find a_1, a_2, a_3 .
- In how many ways a committee of four girls and five boys be formed from a class of 27 girls and 50 boys students?

GROUP-C

Answer any *two* questions

12×2 = 24

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

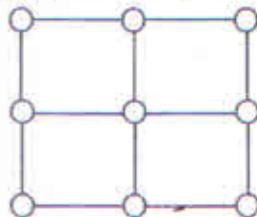
$$(p \wedge q) \vee (\neg p \wedge \neg q)$$

- (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. State and explain Master Theorem.

- 15.(a) Prove that a graph is bipartite if and only if every cycle contains an even number of edges.

- (b) Check whether the following graph is a bipartite graph or not.



16. Using the laws of propositions prove that

(i) $\sim(p \vee q) \vee (\sim p \wedge q) \equiv \sim p$

(ii) $(p \rightarrow q) \wedge (r \rightarrow q) \equiv (p \vee r) \rightarrow q$.

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UNIVERSITY OF NORTH BENGAL

B.Sc. Major 2nd Semester Examination, 2026

COMSMAJ204-COMPUTER SCIENCE

OBJECT ORIENTED PROGRAMMING USING JAVA

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 are keywords in Java?
2. Define scope and extent of a variable.
3. What is the use of final keyword?
4. Discuss autoboxing and unboxing.
5. Explain string immutability.
6. Discuss array in detail.

GROUP-B

Answer any four questions

6×4 = 24

7. Explain Java tokens with examples.
8. Discuss argument passing in methods in Java.
9. Write a note on access specifiers in Java.
10. What is method overloading? Explain with examples.
11. Describe exception handling with try-catch.
12. Discuss wrapper classes in Java.

GROUP-C

Answer any two questions

12×2 = 24

13. Explain classes, objects, constructors and methods with examples.
14. Describe interfaces and packages with examples.
15. Explain control statements and nesting with suitable examples.
16. Draw and explain the life cycle of an applet in detail.

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সমান্য মন্ত্র: সমিতি: সমান্য

UNIVERSITY OF NORTH BENGAL
BCA Major 2nd Semester Examination, 2026

BCAPMAJ203-BACHELOR OF COMPUTER APPLICATION

DIGITAL ELECTRONICS

Time Allotted: 2 Hours 30 Minutes

Full Marks: 60

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GROUP-A

Answer any four questions

3×4 = 12

1. Define floating point representation.
2. What is 1's complement and 2's complement?
3. State and prove De Morgan's Law.
4. What is a register?
5. Write and explain the truth table of a XOR gate.
6. Convert the following:
(i) $(101011)_2$ to decimal
(ii) $(75)_{10}$ to binary.

GROUP-B

Answer any four questions

6×4 = 24

7. Simplify using K-map
$$F(A, B, C) = \sum (0, 2, 3, 6)$$
8. Design a 2 to 4 decoder and write its truth table.
9. Explain the working of a 8×1 multiplexer.
10. Design a full adder using two half adders.
11. Explain D-flip flop and T-flip flop.
12. Explain SOP and POS.

GROUP-C

Answer any two questions

12×2 = 24

13. Design a 4-bit binary adder cum subtractor.
14. Design and explain serial-in serial-out and parallel-in parallel-out registers.
15. Explain BCD to seven segment decoder in detail.
16. What are universal gates? Why are they called universal gates? Implement all the basic gates using any universal gate.

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UNIVERSITY OF NORTH BENGAL

BCA Major 2nd Semester Examination, 2026

BCAPMAJ204-BACHELOR OF COMPUTER APPLICATION

JAVA PROGRAMMING

Time Allotted: 2 Hours 30 Minutes

Full Marks: 60

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GROUP-A

Answer any four questions

3×4 = 12

1. What is an interface?
2. Define an applet.
3. What is a class and an object?
4. Define object oriented programming.
5. Discuss method overloading.
6. What are variables and constants in Java?

GROUP-B

Answer any four questions

6×4 = 24

7. Describe the process of compiling and executing a Java program.
8. Explain operators in Java with examples.
9. Explain constructors and their types.
10. Discuss the different features of Java.
11. Write a program in Java using arrays and explain its working.
12. Explain packages and their advantages.

GROUP-C

Answer any two questions

12×2 = 24

13. Explain decision making and looping constructs with examples.
14. Explain inheritance, method overriding and dynamic dispatch in detail.
15. Draw and explain the lifecycle of an applet.
16. Describe in detail the structure of a Java program. Provide a small program to demonstrate each section.

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UNIVERSITY OF NORTH BENGAL

SEC 2nd Semester Examination, 2026

SEC - POOBSEC219-COMPUTER SCIENCE

HTML PROGRAMMING

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. What is HTML?
2. Which tag is used to create a paragraph in HTML?
3. Write the syntax of the line break tag.
4. What is the use of the <title> tag?
5. Which attribute is used to specify the image source?
6. What is the purpose of the <hr>tag?
7. Name any one HTML formatting tag.
8. Which tag is used to create an unordered list?

GROUP-B

Answer any *three* questions

5×3 = 15

9. Explain the basic structure of an HTML document.
10. Describe the use of heading tags in HTML with examples.
11. Explain different HTML formatting tags.
12. Discuss ordered and unordered lists in HTML.
13. Explain how images are inserted into a web page in HTML.

GROUP-C

Answer any *two* questions

10×2 = 20

14. Explain HTML basic tags with suitable examples.
15. Explain HTML forms and different form elements in detail.
16. Describe how tables are created in HTML using rowspan and colspan with examples.
17. Explain how audio and video can be embedded in an HTML page.

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UNIVERSITY OF NORTH BENGAL

B.Sc. Major 2nd Semester Examination, 2025

COMSMAJ203-COMPUTER SCIENCE**DISCRETE STRUCTURES**

Time Allotted: 2 Hours 30 Minutes

Full Marks: 60

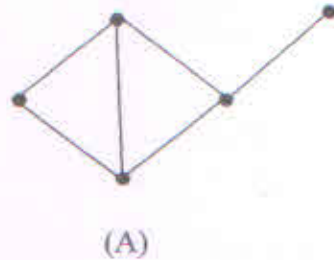
*The figures in the margin indicate full marks.***GROUP-A****Answer any four of the following****3×4 = 12**

1. State the de Morgan's law and prove that using venn diagrams.
2. Find, how many different one to one functions are there from a set A with m elements to a set B with n elements.
3. State the master theorem for solving recurrence relation.
4. Define Big Omega (Ω) notation. Prove that $4n^2 + 2n + 1 = \Omega(n^2)$.
5. Define incidence and degree. Show that the number of vertices of odd degree in a graph is always even.
6. What is Hamiltonian path? Explain with example.

GROUP-B**Answer any four of the following****6×4 = 24**

7. (a) State the sum and product rule of counting theory.
(b) How many ways an organisation containing 26 members can elect a president, a vice president and a secretary?
8. (a) What do you mean by Reflexive, Symmetric and Transitive relations?
(b) Determine whether the following relation is reflexive, symmetric and transitive
 $R = \{(x, y) : y \text{ is divisible by } x\}$ where $x, y \in A = \{1, 2, 3, 4, 5, 6\}$.
9. State and explain well formed formula.
10. (a) Define paths and cycles in a graph.
(b) What do you mean by planar graph?

- (c) Verify whether the following two graphs are isomorphic or not.



- 11.(a) What is tautology and contradiction?

- (b) Prove the following:

$$(p \vee q) \wedge (p \vee \sim q) \equiv p$$

12. Use mathematical induction to prove:

$$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

GROUP-C

Answer any two of the following

12×2 = 24

13. Discuss the significance of asymptotic notations. Explain Iteration method, substitution method and Recursion Tree method for solving recurrence relations.
14. Define spanning tree. What is rank and nullity? Discuss the Kruskal's algorithm for computing minimal spanning tree.
- 15.(a) State and explain pigeonhole principle.
- (b) In a survey of 300 people, 180 like Tea 150 like Coffee and 100 like Juice. Additionally 90 like both Tea Coffee, 60 like both Tea and Juice, 50 like both Coffee and Juice and 30 like all three. How many people like at least one of the beverages?
- (c) Using Mathematical induction principal show that $P(n) = \sum_{i=1}^n i = \frac{n(n+1)}{2}$.
16. Write short notes on the following:
- (a) Poset
- (b) Properties of binary tree
- (c) Euler path.

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