M.Sc. SEMESTER – I

MID Semester - 2024

Paper No. : CS 201 : Probability And Statistics for Computer Science

Time : One Hour **Max. Marks :** 20

Note: Attempt All Questions. The figures in right margin indicate the marks.

1. (a) Give Kolmogorov axiomatic definition of probability. 2

   (b) Define conditional probability. 2

   (c) Discuss concept of statistical independence of events. 2

   (d) Discuss the concept of total probability. 2

   (e) A sample space Ω of an experiment is partitioned into k partition $A_1, A_2, \ldots, A_k$ and B is any event in this sample space. Derive an expression for probability of conditional event $A_i|B$ in terms of probability of conditional event $B \mid A_i$ and probability of partitions $A_1, A_2, \ldots, A_k$. 2

2. (a) Define random variable. Why we need random variable? 3

   (b) Define probability density function and probability distribution function for continuous and discrete random variable. 5

   (c) Give relationship between probability density function and distribution function. 2

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M.Sc. I Sem. Mid-Term Exam CS-202 Theory of Computation 2024

Answer all questions. **[Max Marks: 20; Time 1 Hr]**

1. (a) Which of the following languages over the alphabet $\Sigma=\{a,b\}$ is not regular? **[1]**
   - i. The set of all strings with an equal number of a's and b's.
   - ii. The set of all strings ending in "ab".
   - iii. The set of all strings where every aaa is immediately followed by a bbb.
   - iv. The set of all strings containing at least one "a"

   (b) Consider two regular expressions R1=(0∪1)* and R2=0*1* Which of the following is true? **[1]**
   i. L(R1)=L(R2) ii. L(R1)⊂L(R2) iii. L(R2)⊂L(R1) iv. L(R1)∩L(R2)=∅

   v. None of these

   (c) Which of the following is false regarding the equivalence of DFA and NFA? **[1]**
   - **i.** Every language recognized by an NFA is also recognized by a DFA.
   - **ii.** Every NFA can be converted to an equivalent DFA.
   - **iij.** An NFA can recognize some languages that a DFA cannot.
   - **iv.** An NFA may have multiple transitions for the same symbol from a single state.

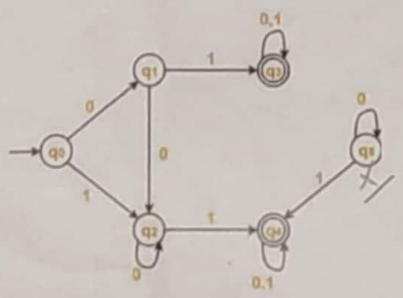
   (d) Which of the following statements is true about the language recognized by an ε-NFA? **[1]**
   - **i.** It is always a non-regular language.
   - **ii.** It can be recognized by a DFA.
   - **iii.** It cannot be recognized by an NFA without ε-transitions.
   - **iv.** It always contains only finite-length strings.

2. Construct regular expression over {1, 2,….9} that represents **[4]**
   i. strings of even numbers with length 4 starting with 2 and ending with 8.
   ii. strings starting with odd numbers and ending with even numbers.

3. Give the mathematical definition of DFA. Construct an equivalent DFA using transition table for nondeterministic finite automaton M = ({q1, q2, q3}, {0, 1}, δ, ql {q3}) where δ is given by δ (q1, 0) = {q2, q3}, δ (q1, 1) = {q1}, δ (q2, 0) = {q1, q2}, δ (q2, 1) = Φ, δ (q3, 0) = {q2}, δ (q3, 1) = {q1, q2}. Show the acceptance of a valid string. **[4]**

4. Describe the extended transition function of NFA. Construct a NFA, using transition diagram, over {0, 1} that accept the string having substring 01 and ends with 1. Show the acceptance of 0111. **[4]**

5. Construct a minimum state automaton using Table filling method equivalent to a given automaton M **[4]**



MCA/MSc. (CS) Semester-I Examination 2024-25
CS204: Object Oriented Programming

Time: 1 hour **20 marks**

1. Write a Java program to convert minutes into years and days. [5 marks]

Test Data: Input the number of minutes: 75367943

2. Write a Java program that requires the user to enter a single character from the alphabet. Print Vowel or Consonant, depending on user input. If the user input is not a letter (between a and z or A and Z), or is a string of length > 1, print an error message. [5 marks]

3. [10 marks]

(a) _____ is the Java feature that allows methods in different classes to be invoked dynamically at runtime.

(b) In a try-catch block, if an exception is not handled, it will propagate to the _____ method.

(c) String can be created in Java using _____ and treated as _____.

(d) *"String s=new String("FHHT");"*. How many objects are created for the given statement in Java?

(e) What will be the output of *"String S1 = 109 + 250+ "MSC" + 20 +20+"MCA"; "* statement when printed?

(f) In a subclass, if we want to call a method from the superclass that has been overridden, we use the _____ keyword.

(g) Is there any explicit use of pointers in Java that would be applicable to objects?

(h) In Java, a _____ class cannot be instantiated directly and must be subclassed.

(i) To prevent a class from being subclassed, the class should be marked with the _____ keyword.

(j) Can you access an instance variable from a static method?

Banaras Hindu University, Varanasi

Department of Computer Science

Midterm Examination, Session 2024-2025

Subject Code & Name: CS-206, Computer Networks

Class: MCA & MSc I Semester **Time: 1 hour** **Maximum Marks: 20**

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1) An ISP is granted a block of addresses starting with 150.80.0.0/16. The ISP wants to distribute these blocks to 2600 customers as follows. [5]

   a. The first group has 200 medium-size businesses; each needs 128 addresses.
   b. The second group has 400 small businesses: each needs 16 addresses.
   c. The third group has 2000 households; each needs 4 addresses.

   Design the sub-blocks and give the slash notation for each sub-block. Find out how many addresses are still available after these allocations.

2) Compare and contrast the fields in the main headers of IPv4 and IPv6. Make a table that shows the presence or absence of each field. [5]

3) What is Address Resolution Protocol (ARP)? Describe ARP packet format. [5]

4) Describe Distance Vector Routing protocol with suitable diagram. [5]

END