

Total No. of Questions : 4]

SEAT No. :

PE-13033

[Total No. of Pages : 2

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**F.Y. B.Sc. (Artificial Intelligence and Machine Learning)
AIML-101-T : OBJECT ORIENTED CONCEPTS AND
PROGRAMMING USING C++
(NEP 2024 Pattern) (Semester - I)**

Time : 2 Hours]

[Max. Marks : 30

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*

Q1) Attempt any Six of the following :

[6 × 1 = 6]

- a) What is mean by polymorphism.
- b) Write the syntax of destructor.
- c) Define abstract class.
- d) What is mean by reference variable.
- e) Enlist the bitwise operators in C++.
- f) List the C++ operators that can not be overloaded.
- g) What is pure virtual function.
- h) Write down the syntax of cin and cout.

Q2) Attempt any Four of the following :

[4 × 2 = 8]

- a) Explain the use of setw () and set precision ().
- b) List different types of constructors in C++.
- c) What is friend function? Enlist the characteristics of friend function.
- d) What are multiple template parameters.
- e) Differentiate between hierarchical and multiple inheritance.

P.T.O.

Q3) Attempt any Two of the following :

[2 × 4 = 8]

- a) Design a C++ class named Employee with suitable data members and member functions. Write a program to create an object of the class and access its members.
- b) Explain function overloading with suitable example.
- c) Explain hybrid inheritance with proper diagram.

Q4) Attempt any Two of the following :

[2 × 4 = 8]

- a) Write a C++ program to print fibonacci series using the default parameters.
- b) Explain inline function in brief.
- c) Explain try-catch and throw statement using suitable example.



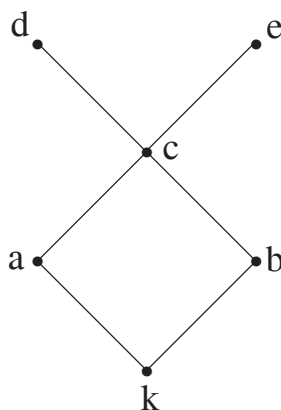
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F.Y. B.Sc. (Artificial Intelligence and Machine Learning)**MTS-101-T : DISCRETE STRUCTURES FOR****COMPUTER SCIENCE****(2024 Pattern) (Semester - I)****Time : 2 Hours]****[Max. Marks : 30****Instructions to the candidates:**

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.

Q1) Attempt any Six of the following :**[6 × 1 = 6]**

- a) Is the following set is empty?
 $A = \{ x | x \text{ is a real number such that } x^2 + 1 = 0 \}$
- b) Find $4!$
- c) How many ways can 3 books be arranged on a shelf?
- d) Hasse diagram of a poset is given below. Find following for the set $A = \{a, k, b\}$
 - i) Upper bound of A
 - ii) Lower bound of A



- e) Find first four terms of the sequence defined by the following recurrence relation :
 $a_n = a_{n-1} + 3a_{n-2}, a_0 = 1, a_1 = 2.$
- f) Find the composition of f and g where $f(x) = 2x + 3, g(x) = 2x.$
- g) Define the Recurrence relation.
- h) $A = \{a, b, c, d, e\}, B = \{d, e, f, g, h\}, C = \{c, h, i, j, k\}$ then find
 - i) $A \cap B$
 - ii) $A \cap C$

P.T.O.

Q2) Attempt any Four of the following :

[4 × 2 = 8]

- a) What is the power set of $\{1, 2, 3\}$?
- b) Consider the following relations on $\{1, 2, 3, 4\}$:
 $R_1 = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 4), (4, 1), (4, 4)\}$
 $R_2 = \{(1, 1), (1, 2), (2, 1)\}$
 $R_3 = \{(1, 1), (1, 2), (1, 4), (2, 1), (2, 2), (3, 3), (4, 1), (4, 4)\}$
 $R_4 = \{(2, 1), (3, 1), (3, 2), (4, 1), (4, 2), (4, 3)\}$ which of these relations are reflexive?
- c) Find the number of arrangements of the letters of the word MATH.
- d) Write the recurrence relation for the sequence : 2, 5, 8, 11,....
- e) What is the order of the recurrence relation $a_n = 3 a_{n-1} + 2 a_{n-2}$

Q3) Attempt any two of the following :

[2 × 4 = 8]

- a) Consider the sets $R = \{1, 2, 3\}$ and $S = \{a, b, c\}$ Find :
 - i) $R \times S$
 - ii) $S \times R$
 - iii) $S \times S$
 - iv) $R \times R$
- b) Find the three digit numbers divisible by 5 which can be formed by using the digits 1, 2, 3, 4, 5.
- c) Determine whether the posets $(\{1, 2, 3, 4, 5\}, 1)$ and $(\{1, 2, 4, 8, 16, 1\})$ are lattices.

Q4) Attempt any two of the following :

[2 × 4 = 8]

- a) How many positive integers between 1000 and 9999 inclusive:
 - i) are divisible by 9?
 - ii) are even?
 - iii) have distinct digits?
 - iv) are not divisible by 3?
 - v) are divisible by 5 or 7?
- b) Show that following relation R on Q is equivalence relation where,
 $R = \{(a, b) / a, b \in Q \text{ and } a-b \in \mathbb{Z}\}$
- c) Solve :
 $a_r - 7a_{r-1} + 10 a_{r-2} = 0$, with $a_0=1, a_1= 2$.



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PE13035

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F.Y. B.Sc. (AI & ML)

STATISTICS

STS - 101 - T : Notion of Statistical Data Analysis
(NEP 2024 Credit Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 30

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Figures to the right indicate full marks.
- 3) Use of single memory non programmable calculator is allowed.
- 4) Symbols and abbreviations have their usual meaning.

Q1) Attempt any SIX of the following :

[6×1=6]

- a) Define less than type cumulative frequency.
- b) The first central moment of data set is.
- c) If the coefficient of Kurtosis $\beta_2 = 3$, identify the type of Kurtosis.
- d) If $(Q_3 - Q_2) > (Q_2 - Q_1)$, then the distribution is
- e) For a data set, upper quartile is 50 and median is 40. If the distribution is symmetric, find the value of lower quartile.
- f) If $\sigma_x^2 = \sigma_y^2 = 3$, $\text{Cov}(x, y) = 2$, Find correlation between variable x and y .
- g) Define bivariate data.
- h) The mean of 10 observations is 50 and coefficient of Variation is 20%. Find the value of the variance.

Q2) Attempt any FOUR of the following :

[4×2=8]

- a) Define the terms :
 - i) Attribute
 - ii) Variable
- b) Define coefficient of determination. And state its interpretation.
- c) Express the second and third central moment in terms of row moments.
- d) Compute coefficient of variation for the following data :
15, 11, 11, 28, 22, 14, 13, 18, 30, 12, 25.
- e) In the regression analysis the equation of two lines of regression is $2x + 3y = 8$ and $x + 2y = 5$, find mean values of x and y .

P.T.O.

Q3) Attempt any TWO of the following :

[2×4=8]

- a) Write a note on Box plot.
- b) The coefficient of correlation between two variables x and y is 0.4, their covariance is 12. If variance of x is 100, what is standard deviation of y ?
- c) Write a short note on stem and leaf chart and construct stem and leaf plot for the following data :

11.2, 11.2, 12.9, 13.1, 10.8, 11.6, 11.7, 11.2, 11.1, 12.3, 12.4, 10.4, 11.7, 11.3, 11.9, 12.0, 12.4, 10.3, 10.7

Q4) Attempt any TWO of the following :

[2×4=8]

- a) The daily expenditure of 94 people is as follows :

Expenditure (in ₹ Hundreds)	20-30	30-40	40-50	50-60	60-70
No. of Persons	14	17	27	21	15

Calculate mode.

- b) Define the term correlation. Explain different type of correlations with two real life examples of each.
- c) Define skewness. Explain type of skewness with the help of sketch.

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SEAT No. :

PE13036

[Total No. of Pages : 2

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First Year B.Sc. (Artificial Intelligence and Machine Learning)

SEC - 101-AIML-T: BASIC PROBABILITY THEORY AND

DISCRETE DISTRIBUTIONS

(NEP 2024 Pattern) (Revised) (Semester - I)

Time : 2 Hours]

[Max. Marks : 30

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicates full marks.*
- 3) *Use of single memory non programmable scientific calculator is allowed.*

Q1) Attempt any Six of the following.

[6×1=6]

- a) Define sample space.
- b) Two fair coins are tossed simultaneously. Find the probability of getting two heads.
- c) Define discrete random variable.
- d) What is posterior probability?
- e) Define geometric distribution.
- f) If $P(A)=0.6$, find $P(A')$.
- g) Find expectation if $X=1,2$ with probabilities 0.4, 0.6.
- h) Find mean of Binomial distribution with $n=6$, $p=0.5$.

Q2) Attempt any four of the following.

[4×2=8]

- a) Define conditional probability with one illustration.
- b) Define Mathematical Expectation and variance of a discrete random variable.
- c) A card is drawn at random from a well-shuffled pack of 52 cards
 - i) Find the probability that the card is Heart.
 - ii) Find the probability that the card is King.
- d) If $P(A)=0.6$ and $P(B/A)=0.5$, find $P(A \cap B)$.
- e) Find variance of Bernoulli distribution with $P=0.3$.

P.T.O.

Q3) Attempt any two of the following. **[2×4=8]**

- a) Define the Bernoulli distribution. Obtain its mean and variance and give one real-life example.
- b) Define sensitivity and specificity of a test. Write expression for false positive and false negative.
- c) The probability mass function of a discrete random variable X is given by. $P(x=x)=Kx$, for $X=1,2,3,4$
 - i) Find the value of K .
 - ii) Find the expectation $E(X)$.

Q4) Attempt any two of the following. **[2×4=8]**

- a) State Baye's Theorem. Also derive the Multiplication Theorem of probability $P(A \cap B) = P(A).P(B/A)$.
- b) Two dice are thrown simultaneously. Find the probability that
 - i) The sum of the numbers obtained is 7, and
 - ii) The sum of the numbers is a prime number.
- c) Define the Binomial Distribution. Obtain its mean and variance and give one real-life example.

