

TILAK MAHARASHTRA VIDYAPEETH, PUNE
MASTER OF COMPUTER APPLICATIONS
EXAMINATION : DECEMBER - 2023
SEMESTER – I

Sub: Discrete Mathematics (MCA-100-22)

Date :19/12/2023

Total Marks : 60

Time: 2.00 pm To 4.30 pm

Instruction:

1. All questions are compulsory unless and otherwise stated.
2. Bold figures to the right of every question are the maximum marks for that question.
3. Candidates are advised to attempt questions in order.
4. Answers written illegibly are likely to be marked zero.
5. Use of scientific calculators, Log tables, Mollier Charts is allowed.
6. Draw neat and labelled diagram wherever necessary.

Q.1 Answer the following in 2-3 lines (Any 5)

(10)

1. If $p = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 3 & 1 & 2 \end{pmatrix}$ and $q = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 1 & 3 \end{pmatrix}$. Find pq & qp
2. Show that the only idempotent element in group G is the unit element.
3. If X has a Poisson distribution with Parameter, $m = 3$. Find $P(x \leq 1)$.
(Given that: $e^{-3} = 0.0497$)
4. If $X \sim B(n, p)$. Find p & q if $n = 6$ and $P(x = 2) = P(x = 4)$.
5. If $f(x) = \frac{2x-3}{5}$. Find $f^{-1}(-1)$ and $f^{-1}(4)$.
6. State True or False:
 - (i) In case of Binomial distribution, Mean > Variance.
 - (ii) In case of Poisson Distribution, Mean = Variance.
7. If $f(x) = 2x + 3$ and $g(x) = 3x - 2$. Find $f \circ g$ & $g \circ f$.

Q.2 Answer the following in short. (Any 4)

(20)

1. Show that: A group G is cyclic then it is abelian.
2. Suppose that the life time of a certain electronic component is exponentially distributed with a mean life of 1200 hrs. What will be the probability that a component will work till 2400 hrs?
3. If $f(x) = \frac{1}{\sqrt{10\pi}} e^{\left(\frac{-x^2}{10} + 4x - 40\right)}$, $-\infty < x < \infty$
is the p.d.f. for Normal distribution. Find all the parameters.

4. State, which among the following are statements in Logic? If yes, find their truth values.
- Keep the door open.
 - $3 + 4i$ is a complex number.
 - Congruent quadrilaterals are similar.
 - It rains heavily.
 - All real numbers are whole numbers.
5. Express the permutation $k = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 2 & 3 & 5 & 8 & 7 & 6 & 1 & 4 \end{pmatrix}$ as a product of cycles.
6. Solve the equations by Cramer`s Rule:
 $2x + 3y - z = 4$, $x - y + 2z = 2$, $5x - y - 8z = -4$

Q.3 Answer the following in detail. (Any 3)

(30)

1. If $p(X = x) = \binom{6}{x} \times \left(\frac{1}{2}\right)^6$, $x = 0,1,2,3,4,5,6$.
 $= 0$, otherwise.
 Find : $p(x = 2)$, $p(x = 4)$. Comment on the result.
 Also find $p(x \leq 4)$ and $p(x \geq 4)$.
2. Solve:
- There are three baskets. A, B and C. Basket A contains 4 white, 2 black and 1 green balls. Basket B contains 3 white, 2 black and 2 green balls. Basket C contains 1 white, 1black and 3green balls. One of the three types of baskets is selected at random and a white ball is drawn from it. What is the probability that it from basket C?
 - In a Binomial distribution, mean = 3, variance = 3/2. Find the probability of at least 4 successes.
3. A player tosses 2 fair coins. He wins Rs.5 if 2 heads appears, Rs.2 if 1 head appear and Re.1 if no head appear. Find his expected winning amount and variance of winning amount.
4. Prove :
- Left cancellation Law in a Group.
 - Right cancellation law in a Group.
