CB

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MASTER OF COMPUTER APPLICATIONS

EXAMINATION : JANUARY- 2023

SEMESTER - I

Sub: Discrete Mathematics (MCA-100-22)

Date : 03/01/2023	**Total Marks : 60**	**Time: 10.00 am to 12.30 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 $X \sim B(n, p)$. Find p, if $n = 6$ and $P(x = 4) = P(x = 2)$.
2. Write True or False:
   (i) For Binomial distribution, Mean = Variance.
   (ii) For Poisson distribution, Mean > Variance.
3. Check whether the function $f(x) = 5x + 3$, $x \in R$. is injective or not?
4. Show that: If G is cyclic group then it is abelian.
5. Show that: The only idempotent element in group G is the unit element.
6. If $A = \{10,20,30,40,50\}$, $B = \{40,50,60,70\}$ &
   Universal set $U = \{10,20,30,40,50,60,70,80,90,100\}$.
   Find the sets $(A - B)$ & $(B - A)$.
7. If $A = \begin{bmatrix} 5 & -1 \\ 6 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 1 \\ -3 & 4 \end{bmatrix}$. Find AB and BA. Are they equal?

Q.2 Answer the following in short. (Any 4) **(20)**

1. There are 3 bowls, A,B & C. Bowl A contains 3 coffee biscuits and 2 orange biscuits. Bowl B contains 2 coffee biscuits & 2 orange biscuits. Bowl C contains 3 coffee biscuits and 4 orange biscuits. Chintu came a picked up a coffee biscuit from one of the three bowls. Find the probability that it is from bowl C.
2. If $p(x) = k.\binom{4}{x}$, $x = 0,1,2,3,4.$ is pmf. Find k & $P(x \geq 3)$
3. Show that: Group G is abelian if and only if $(ab)^2 = a^2.b^2 \ \forall a,b \in G.$
4. If $p = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 3 & 1 \end{pmatrix}$, $q = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 1 & 4 & 2 \end{pmatrix}$ & $r = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 2 & 1 & 3 \end{pmatrix}$

   Find : (i) p^{-1} (ii) qp^{-1} (iii) $r.qp^{-1}$

5. If $A=\begin{bmatrix}1 & 2 & -5\\ 0 & 2 & -3\\ 4 & 1 & 7\end{bmatrix}$. Find the Inverse of matrix if it exists, by Adjoint matrix method.

Q.3 Answer the following in detail. (Any 3) (30)

1. A coin is tossed 12 times. Find the probability of getting
   - (i) Exactly 2 heads.
   - (ii) Atleast 2 heads.
   - (iii) Atmost 2 heads
   - (iv) No heads
   - (v) No tails.

2. It is known that, in a certain area of large city, the average number of vehicles per bunglow is five. Assuming that the number of vehicles follows a Poisson distribution, find the probability that, in a randomly selected bunglow
   - (i) There are more than 5 vehicles
   - (ii) There are exactly 5 vehicles
   - (iii) There are in between 5 to 7 vehicles, (both inclusive)

   Given that: $\left(e^{-5}=0.0067\right)$

3. Prove: Left cancellation and Right cancellation law in a group.

4. A problem in Mathematics is given to three students, A,B & C ; whose chances of solving it are $\frac{1}{3},\frac{1}{4}\,\&\,\frac{1}{5}$ respectively. Find the probability of the following events if all of them have tried independently:
   - (i) Exactly one of them could solve the problem
   - (ii) Exactly two of them could solve the problem.
   - (iii) The problem is solved.
   - (iv) The problem remain unsolved.
