Batch 2022-2024

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MASTER OF COMPUTER APPLICATIONS (MCA)

MASTER OF SCIENCE (M.SC) IN COMPUTER APPLICATIONS

EXAMINATION : MAY - 2024

SEMESTER - I

Sub: Discrete Mathematics (MCA-100-22/MSC100-22)

Date : 28/05/2024 **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 $p=\begin{pmatrix}1&2&3&4\\4&1&3&2\end{pmatrix}$, $q=\begin{pmatrix}1&2&3&4\\1&4&2&3\end{pmatrix}$. Find $(p.q)^{-1}$
2. If $f(x)=x+1,\ g(x)=2x-1,$
   Find: fog & gof. Are they Equal?
3. If X has a Poisson Distribution with a parameter $m=3.$ Find $P(x\le 1)$.
   (Given that: $e^{-3}=0.0497$)
4. Check whether the function $f(x)=\frac{5x^2}{3}+21$ is even or odd?
5. If $a=b$ then $a^2=b^2$.
   Re-write the above statement without using if-then.
6. Find the order of permutation:
   $p=\begin{pmatrix}1&2&3&4&5&6&7&8\\6&7&4&8&2&5&3&1\end{pmatrix}$
7. Write down True or False:
   (i) In case of Binomial distribution, Mean = Variance.
   (ii) In case of Poisson distribution, Mean > Variance.

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

1. Solve the equations by Cramer`s Rule:
   $x-y-4z=-5,\ x+2y-6z=11, 4x+y-2z=24$
2. Let G be the group and $a,b\in G$. Then the equation $ax=b$ has unique solution.
3. If $X\sim B(n,p)$. Find p & q if, $P(x=2)=P(x=4)$ and $n=6$.
4. Find $E(x)$ and $V(x)$ for the following probability distribution:

x	0	1	2	3	4	5
p(x)	0.1	0.2	0.23	0.17	0.12	0.18

Write down the Negations of the following statements in Logic:

5. (i) Some rectangles are squares.
   (ii) 2 is the only even prime number or 9 is a perfect square.
   (iii) Venus is a star if and only if Jupiter is a planet.

6. There are two baskets. Green basket and Blue basket. Green basket contains 4 black, 2 red and 2 white balls. Blue basket contains 2 black, 2 red and 3 white balls.One of the two baskets is selected at random and a white ball is drawn at random from it. Find the probability that it is from green basket.

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

1. In how many ways a committee of 4 persons can be formed from 6 Doctors and 7 Lawyers so that a committee should consists of
   (i) Equal no. of Doctors & Lawyers.
   (ii) Majority of Doctors
   (iii) Atmost one Doctor.
   (iv) Atleast one Doctor.

2. Suppose that the life time of a certain electric component is exponentially distributed with a mean life of 1600 hrs. What is the probability that,
   (i) The component will work up to 2400 hrs.
   (ii) The component will survive after 1000 hrs.

Solve:

3. (i) Find 'x' if, $A^2 = B$. Where, $A = \begin{bmatrix} 2 & 12 \\ 0 & 1 \end{bmatrix}$ & $B = \begin{bmatrix} 4 & x \\ 0 & 1 \end{bmatrix}$

   (ii) If $A = \begin{bmatrix} 4 & 1 \\ -1 & 2 \end{bmatrix}$, Show that : $A^2 - 6A + 9I = 0$. Where I is the identity matrix of order 2.

4. If $f(x) = x + 3$, $g(x) = x - 2$, Find: $f^{-1}(x), g^{-1}(x), fof, gog$.
   Also find $f^{-1}(4), g^{-1}(2), fof(-1), gog(0)$
