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MASTER OF SCIENCE (COMPUTER APPLICATIONS-MSC-CA)
EXAMINATION : DECEMBER - 2024
SEMESTER - I
Sub : Discrete Mathematics (MSC24 -103)

Date : 27/12/2024

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. Find the different number of arrangements of the letters of the word 'BIRTHDAY'.

2. If $f(x) = \frac{2x-5}{4}$ Show that: $f^{-1}(x)$, $f^{-1}(2)$ & $f^{-1}(-1)$

3. A random variable X follows Poisson Distribution with parameter 'm' such that,

$$p(X = 2) = \frac{3}{4} \times p(X = 1) \text{ Find 'm'.$$

4. Write the duals of the following statements:

- (i) $[p \vee (\sim p)] \equiv T$

- (ii) $[p \wedge (\sim p)] \equiv F$

5. Check whether the following data represents p.m.f. or not?

X	-2	-1	0	1	2
P(X)	0.41	0.01	0.25	0.04	0.05

6. Write the negation of the statements :

- (i) All equilateral triangle are equiangular.

- (ii) Mars is a planet if and only if Sun is a star.

7. If $A = \begin{bmatrix} 0 & 4 & 3 \\ 1 & -3 & -3 \\ -1 & 4 & k \end{bmatrix}$ is singular matrix find the value of 'k'.

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

1. How many 4 digits numbers in between 3000 and 7000 (both inclusive) can be formed with the numbers 0,1,2,3,4,5,6,7,9 if the repetition of the digits is allowed.
2. If $f(x) = \frac{ax+b}{cx-a}$. Find the value of $f(f(x))$.
3. A lot of 100 sockets contain 10 defective. 5 sockets are selected at random from a lot and sent it to the shopkeeper. What is the probability that a shopkeeper will receive at least one defective socket?

4. If $A = \begin{bmatrix} 0 & 4 & 3 \\ 1 & -3 & -3 \\ -1 & 4 & 4 \end{bmatrix}$ find the value of A^{-1} by Adjoint method.
5. Solve the following equations by Cramer's rule:
 $x + y + z = 1$, $3x + 2y + 4z = 9$ and $3x - 5y + z = -1$
6. Show that: G is abelian group if and only if $(a.b)^2 = a^2.b^2$, $\forall a, b \in G$

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

(30)

1. (i) If G is a group in which $(a.b)^i = a^i.b^i$ for three consecutive integers i , $\forall a, b \in G$.
 Show that : G is abelian group.
 (ii) Show that: If group G is cyclic then it is abelian.
2. (i) There are 4 boxes A,B,C,D. Box A has 2 white balls and 3 black balls. Box B has 4 white balls and 1 black ball. Box C has 5 white balls and 2 black balls. Box D has 3 white balls and 3 black balls. One of the box is selected at random and a white ball is drawn from it. Find the probability that it is from box C.
 (ii) On a shooting range the probability that A could shoot the target is $1/5$, that of B is $2/3$ and that of C is $3/4$. Find the probability that exactly two of them could shoot the target if all of them tried independently.
3. (i) In how many ways 4 books of Geography and 2 books of History can be arranged among themselves if the books of Geography should be never together.
 (ii) Show that : CALCUTTA is twice of AMERICA with respect to the number of arrangements of the letters in it.
4. Find $E(X)$ and $V(X)$ from the following probability distributions:

X	-3	-2	-1	0	1	2	3	4
P(X)	0.11	0.12	0.25	0.34	0.05	0.02	0.07	0.09

5. Check whether the following statements shows Tautology, Contradiction or Contingency?
 - (i) $(p \rightarrow q) \leftrightarrow (\sim p \vee q)$
 - (ii) $(p \wedge (\sim q)) \leftrightarrow (p \rightarrow q)$
 - (iii) $((\sim p) \rightarrow q) \wedge (p \wedge r)$
