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MASTER OF SCIENCE (M.Sc) in COMPUTER APPLICATIONS
EXAMINATION : DECEMBER - 2024
SEMESTER - I
Sub: Discrete Mathematics (MSC-100-22)

Date : 24/12/2024**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. If $f(x) = x^2 + \frac{1}{x^2}$. Find the value of $f(x) + f(-x)$
2. In a binomial distribution, Mean = 7, Variance = 7/2. Find all the parameters.
3. Write True or False for:
 - (i) In case of Binomial distribution, Mean and Variance are always equal.
 - (ii) Karl Pearson's correlation coefficient is always less than -1 for any bivariate data.
4. In how many ways a three digit numbers can be formed by using the digits 0,1,2,4,6,9 if repetition of the digits is not allowed?
5. What is probability mass function?
6. What is an even function? Give example.
7. Calculate Karl Pearson's correlation coefficient for the following data:
 $\sigma_x = 25, \sigma_y = 25, Cov(X, Y) = 100$.

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

1. Find the value of Variance for the following probability distribution:

X	0	1	2	3	4	5
P(X)	0.11	0.16	0.35	0.22	0.09	0.07

2. If $f(x) = \left(\frac{x+3}{4x-5}\right)$, $g(x) = \left(\frac{3+5x}{4x-1}\right)$ Find $f \circ g$.
3. If G is a group. $a, b \in G$. Show that : $(ab)^{-1} = b^{-1} \cdot a^{-1}$
4. There are two sacks. Sack A contains 3 green balls and 4 yellow balls. Sack B contains 2 green balls and 3 yellow balls. One of the sacks is selected at random a yellow ball is drawn at random. Find the probability that it is from sack B.

5. Show that: If G is a cyclic group then G is abelian.
6. A problem in Mathematics is given to three students A,B and C. Probability that A could solve the problem is $\frac{1}{5}$, that of B is $\frac{2}{3}$ and that of C is $\frac{3}{4}$. Find the probability that the problem will get solved if all of them tried independently.

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

(30)

1. (a) Find the distinct arrangements of the letters of the words : (i) MATHEMATICS
(ii) STATISTICS (iii) INDEPENDENCE
(b) With the help of truth tables, show that : $[\sim (p \vee q) \vee (\sim p \wedge q)] \equiv (\sim p)$
2. In how many ways a committee of 5 students can be formed from 10 students so that
(i) Two particular students A & B should always be there in a committee.
(ii) Two particular students A & B should never be there in a committee.
(iii) Student A is ready to be a part of committee only if a student B is not there in a committee.
(iv) Student A is ready to be a part of committee only if student B is not there in a committee.
3. If $p = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 6 & 1 & 5 & 2 & 4 & 3 \end{pmatrix}$, $p = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 6 & 2 & 3 & 4 & 5 & 1 \end{pmatrix}$. Find : (i) pq (ii) qp
(iii) pq^{-1} (iv) qp^{-1}
4. For the following probability distribution, find: (i) P(x is even number) (ii) P(X is an odd number) (iii) P(x is a whole number) (iv) P(x is non negative number) (v) P(x is positive number).

x	-3	-2	-1	0	1	2	3
p(x)	0.15	0.25	0.11	0.14	0.19	0.10	0.06
