

**TILAK MAHARASHTRA VIDYAPEETH, PUNE**  
**MASTER OF SCIENCE (M.SC) IN COMPUTER APPLICATIONS**  
**EXAMINATION : DECEMBER-2022**  
**SEMESTER - I**  
**Sub: Discrete Mathematics (MSC-100-19)**

Date : 20/12/2022

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. An element  $a$  in group  $G$ , is said to be ..... , if  $a^2 = a$ .  
 (a) idempotent (b) commutative (c) abelian (d) associative
2. In how many ways a group of 3 persons can be formed from 3 ladies & 2 gentlemen?  
 (a) 20 ways. (b) 12 ways. (c) 10 ways. (d) 15 ways.
3. A function which is 'one-one' then it is said to be ...  
 (a) injective (b) surjective (c) bijective (d) inverse
4. The p.m.f. of Poisson distribution can be expressed as....  
 (a)  $\frac{e^{-m} \times m^x}{x!}$  (b)  $\frac{e^{-x} \times x^m}{m!}$  (c)  $\frac{e^m \times m^x}{x!}$  (d)  $\frac{e^x \times m^m}{m!}$
5. If  $f(x) = 9x - 1$  then,  $f(x)$  is.... function.  
 one-one (b) many-one (c) not a (d) None of these
6. A matrix of which the value of determinant is any value other than zero, is called as.....  
 (a) singular matrix (b) non-singular matrix  
 (c) scalar matrix (d) diagonal matrix
7. For some element  $a$  in group  $G$ ,  $G = \langle a \rangle$  (i.e.  $a$  is the generator of the group  $G$ ) then, group  $G$  is called..... group.  
 (a) abelian (b) cyclic (c) inverse (d) unit

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

1. If  $G$  is a group,  $a, b \in G$ . Show that :  $(a.b)^{-1} = b^{-1}.a^{-1}$
2. The probability that team A wins the match against team B is  $2/3$ . Find the probability that team A wins at least one game out of 4 games plays against team B.
3. Solve the equations by Cramers Rule:  
 $5x - y - 2z = 2, 2x + y - z = 2, 3x + 2y + z = 6$ .
4. Check whether the functions are even or odd?  
 (i)  $f(x) = \frac{x^2 + 6}{3x^4}$  (ii)  $f(x) = \frac{x + 6}{5 - x}$

5. If  $p = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 1 & 4 & 2 \end{pmatrix}$ ,  $q = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 3 & 1 \end{pmatrix}$ . Find:  $p^{-1}$  &  $qp.p^{-1}$

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

**(30)**

1. 20 Doctors, 30 Engineers and 50 Architects were interviewed for a post of Director of a firm. The probability of selection of a doctor as a director is 0.45. That of a Engineer is 0.38 and that of an architect is 0.60 . One of the three types of candidates is selected at random who has been selected as a director, find the probability that he/ she is an architect.
  
2. (A) Re-write the following statements by using if-then.
  - (i) If  $f(x) = 0$  then  $f(x)$  is divisible by  $(x - 1)$ .
  - (ii) If a man is a judge then he is clever.  
 (B) Use quantifiers to convert each of the following open statements defined on a set of Natural Numbers (N) into TRUE statements.
  - (i)  $x^2 - 100 = 0$
  - (ii)  $3y + 4 \leq 10$
  
3. If G is a group in which  $(a.b)^i = a^i . b^i$  for three consecutive integers ' i ' , for all  $a, b \in G$  then, show that: Group G is abelian.
  
4.
  - i. If  $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ , Check whether matrix A satisfies the equation  $A^2 - 5A + 7I = 0$ .
  - ii. Find 'k' if,  $A^2 = 8A + kI$  where,  $A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$ .

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