**COURSE : Mathematical Structures**

**COURSE CODE : 21MAT41A**

**MODULE – 3: Functions**

**Question Bank**

| **Q.No** | **Questions** |
| --- | --- |
| **1** | Find and in each of the following |
| **2.** | (a) Let and and be a relation from to defined by  . Is a function from to ?  (b) Let and and be a relation from to defined by  . Is a function? |
| **3.** | a) Let . Consider the function defined by for belonging to . Find the range of f.  b) Let Consider the function (where is the set of all real numbers) defined by for . Find the range of . |
| **4.** | Let and . Find whether the following functions from to are  a) One-to-one  (b) Onto |
| **5.** | (a). For and a function is defined by  ), (2,x), (3,x), (4,y), (5,y)}. Find the image of the following subsets of , under  (b). Let be defined by  Determine |
| **6.** | a) Let z denote the set of all integers. function is defined by . Find and , where  b) Let be defined by for . Find whether is one-to-one or onto (or both or neither) |
| **7.** | (a) If f : A -> B, then determine if f is one to one or onto  (i) A = R , B = {x | x is real number and x > 0 } ; f(a) = |a|  (b) A= {1, 2, 3, 4} and B = {a, b, c, d} , f= {(1,a), (2,a), (3,d), (4,c)} |
| **8.** | a) Let and be finite sets and f is a function defined from A to B, then if f is one to one, then  show that  b) If there are 120 one-to-one functions from to and , what is ? |
| **9.** | (a) Let and be finite sets with & . Find how many one-to-one functions  are possible from to  (b) If there are 60 one-to-one functions from to and , what is ? |
| **10.** | a) Let and . Find the number of onto functions from to  b) For A = {1, 2, 3} and B = {w, x, y, z}, let R = {(1,w), (2,x), (3,x)} and R'={(1,w), (2,x)} .Which is these relations from A to B are functions from A to B? |
| **11.** | a) Let and .  Find how many functions are there from A to B. How many of these are one-to-one?  How many are onto?  b) Let and .  Find how many functions are there from B to A. Find how many of these are onto?  How many are one-to-one? |
| **12.** | a) Evaluate , using and  b) Determine the minimum number of elements to be selected from the set  S = {1, 2, 3, 4, 5, 6, 7, 8, 9} such that the sum of two of them is 10. |
| **13.** | a) Evaluate and .  b) Evaluate S (7,2) |
| **14.** | a) There are six programmers who can assist eight executives. In how many ways can the  executives be assisted so that each programmer assists at least one executive?  b) Show that among 13 persons there are at least two persons who are born in the same  month. |
| **15.** | a) Find the number of ways distributing four distinct objects among three identical containers, with some container(s) possibly empty.  (b) Let A and B be finite sets with |A| = 10 and |B| = 15. Find how many functions are possible from A to B? |
| **16.** | a) Find the number of ways of distributing 6 objects among 4 identical containers, with some  container(s) possibly empty  b) What is the minimum number of students required in a class to be sure that at least five  will receive the same grade if there are four possible grades say A, B, C and D? |
| **17.** | (a). Seven members of a family have total of Rs.2886 in their pockets. Show that at least  one of them must have at least Rs.416 in his pocket.  (b). If 9 books are to be kept in 4 shelves, show that there must be at least one shelf  which contains at least 3 books. |
| **18.** | (a). How many people must you have to guarantee that at least 9 of them will have birthdays in the same day of the week.  (b). Show that if 30 dictionaries in a library contain a total of 61327 pages, then one of the dictionaries must have at least 2045 pages. |
| **19.** | a) Consider the functions and defined by and ,  find , and  b) Show that among any group of five integers (not necessarily consecutive) , there are 2  integers with the same remainder when divided by 4. |
| **20.** | a) Let and be any two functions. Then show that the following are true.   1. If and are one-to-one, so is . 2. If is one-to-one, then is one-to-one. 3. If and are onto, so is . 4. If is onto, then is onto.   b) If 20 candidates appear in a competitive exam, then show that there exists at least two  among them, who roll number differ by a multiple of 19. |