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Class	5: XI	Unit 1 - Se	ts and Functio	ns	Marks: 45	
Subject: Mathematics			Time: 1.30 Hours			
Part I C	hoose the Best A	nswer		10	X 1 = 10	
1. 7	The only function which is both odd and even function is the					
1) One to One F	unctions	2) Zero Functi	ons		
3	6) Odd Function	ns	4) Even Funct	ions		
2) 7	2) The number of students who take both the subjects Mather					
a	nd Chemistry	is 70. This	represents 10	% of the e	enrollment in	
Ν	Mathematics and 14% of the enrollment in Chemistry. The number					
C	of students take at least one of these two subjects, is					
(1) 1120 (2	2) 1130	(3) 1100	(4) insuffic	ient data	
3)]	The number of re	, elations on a	set containing	3 elements	is	
ý (1) 9 (2)) 81	(3) 512	(4) 1024		
4)]	4) The number of constant functions from a set containing <i>m</i> element					
t (5) T	to a set containing <i>n</i> elements is (1) <i>mn</i> (2) <i>m</i> (3) <i>n</i> (4) <i>m</i> + <i>n</i> The function $f: \mathbb{R} \to \mathbb{R}$ is defined by $f(x) = \sin x + \cos x$ is					
((1) an odd function					
(2) neither an odd function nor an even function						
(5) an even function (4) both odd function and even function. (5) $f(x) = x x $ is also an Eulertian						
1) Decreasing 2)	Increasing	3) Zero	4) odd		
7) A	relation R in a se	et A is said t	o be an	rel	ation if	
R is reflexive, symmetric and transitive						
1) Equivalence 2)	onto	3) constant	4) one to o	ne	
8) L	$\operatorname{et} f : \mathbb{R} \otimes \mathbb{R}$ be de	fined as $f(x)$	= 3x. Choose	the correct a	answer.	
(1) f is one-one or	nto	(2) f is many-c	one onto		
(3) f is one-one but not onto (4) f is neither one-one nor onto.						
9) A of a graph is a vertical or horizontal shift of						
the graph that produces congruent graphs.						
10) Let $Y = \begin{pmatrix} 1 & 2 & 3 \\ 1 $						
(3, 1) (1, 4) (4, 1)} Then R is						
(1) Reflexive (2)) symmetric	(3) transitive	(4) equival	ence	

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Part II Answer the Following Questions

Q.No 16 Compulsory

- 11. Write the set $\{-1, 1\}$ in set builder form.
- 12. If $f: \mathbb{R} \to \mathbb{R}$ is defined as $f(x) = 2x^2 1$, find the pre-images of 17, 4
- 13. Let $f = \{(1, 4), (2, 5), (3, 5)\}$ and $g = \{(4, 1), (5, 2), (6, 4)\}$. Find $g \circ f$. Can you find $f \circ g$?
- 14. Show that if *f* : A ® B and *g* : B ® C are one-one, then *gof* : A ® C is also one-one.
- 15. Show that the relation R in the set $\{1, 2, 3\}$ given by R = $\{(1, 2), (2, 1)\}$ is symmetric but neither reflexive nor transitive.
- 16. The total cost of airfare on a given route is comprised of the base cost *C* and the fuel surcharge *S* in rupee. Both *C* and *S* are functions of the mileage *m*; C(m) = 0.4m + 50 and S(m) = 0.03m. Determine a function for the total cost of a ticket in terms of the mileage and find the airfare for flying 1600 miles.

Part III Answer the Following Questions

4 X 3 = 12

Q.No 22 Compulsory

- 17. Let $S = \{1, 2, 3\}$. Determine whether the functions $f: S \otimes S$ defined as below have inverses. Find f 1, if it exists.
 - (a) $f = \{(1, 1), (2, 2), (3, 3)\}$
 - (b) $f = \{(1, 2), (2, 1), (3, 1)\}$
 - (c) $f = \{(1, 3), (3, 2), (2, 1)\}$
- 18. Give an example of a relation. Which is Symmetric but neither reflexive nor transitive?
- 19. Prove that the function $f : \mathbb{R} \otimes \mathbb{R}$, given by f(x) = 2x, is one-one and onto
- 20. From the curve y = sinx, draw y = sin |x| (Hint: sin(-x) = -sin x.)
- 21. A simple cipher takes a number and codes it, using the function f(x) = 3x-4. Find the inverse of this function, determine whether the inverse is also a function and verify the symmetrical propertyabout the line y = x (by drawing the lines).
- 22. Let $f : \{1, 3, 4\} \otimes \{1, 2, 5\}$ and $g : \{1, 2, 5\} \otimes \{1, 3\}$ be given by $f = \{(1, 2), (3, 5), (4, 1)\}$ and $g = \{(1, 3), (2, 3), (5, 1)\}$. Write down *gof*.

Part IV Answer all the Questions

4 X 5 = 20

23) a) Consider $f : \mathbf{R} \otimes \mathbf{R}$ given by f(x) = 4x + 3. Show that f is invertible. Find theinverse of f.

(or)

b) Suppose that 120 students are studying in 4 sections of eleventh standard in a school. Let A denote the set of students and B denote the set of the sections. Define a relation from A to B as "*x* related to *y* if the student *x* belongs to the section *y*". Is this relation a function? What can you say about the inverse relation? Explain your answer.

24) a) Let f: X ® Y be an invertible function. Show that the inverse of f^{-1} is f, i.e., $(f^{-1})^{-1} = f$.

(or) b) Let A = $\{1, 2, 3\}$, B = $\{4, 5, 6, 7\}$ and let $f = \{(1, 4), (2, 5), (3, 6)\}$ be a function from A to B. Show that f is one-one.

25) a) $f : \mathbb{R} \to \mathbb{R}$ is defined by f(x) = 2x - 3 prove that f is a bijection and find its inverse.

(or)

b) Discuss the following relations for reflexivity, symmetricity and transitivity:

(i) The relation R defined on the set of all positive integers by "mRn if m divides n".

(ii) Let *P* denote the set of all straight lines in a plane. The relation *R* defined by " $_Rm$ if _ is perpendicular to m".

(iii) Let *A* be the set consisting of all the members of a family. The relation *R* defined by "aRb if *a* is not a sister of *b*".

(iv) Let *A* be the set consisting of all the female members of a family. The relation *R* defined by "aRb if *a* is not a sister of *b*".

(v) On the set of natural numbers the relation *R* defined by "*xRy* if x + 2y = 1".

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26)a) Give an example of a relation. Which is

(i) Symmetric but neither reflexive nor transitive.

- (ii) Transitive but neither reflexive nor symmetric.
- (iii) Reflexive and symmetric but not transitive.
- (iv) Reflexive and transitive but not symmetric.
- (v) Symmetric and transitive but not reflexive.

(or)

b) Check the injectivity and surjectivity of the following functions: (i) $f: \mathbf{N} \otimes \mathbf{N}$ given by $f(x) = x^2$ (ii) $f: \mathbf{Z} \otimes \mathbf{Z}$ given by $f(x) = x^2$ (iii) $f: \mathbf{R} \otimes \mathbf{R}$ given by $f(x) = x^2$ (iv) $f: \mathbf{N} \otimes \mathbf{N}$ given by $f(x) = x^3$ (v) $f: \mathbf{Z} \otimes \mathbf{Z}$ given by $f(x) = x^3$

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