

Chapter: - Relations, Functions and Linear Programming**1 marks question**

Q1. If $A = \{1, 2, 3\}$ and R is a relation on set A , where $R = \{(1,1), (2,2), (3,3)\}$ then find R is an equivalence relation or not. **Ans.** Yes

Q2. Let $A = \{1, 2, 3\}$. Find the number of relation on A containing $(1, 2)$ and $(2, 3)$ which are reflexive and transitive but not symmetric. **Ans.** 4

Q3. Let $A = \{1, 2, 3\}$. Find the number of equivalence relation on A , containing $(1, 2)$ and $(2, 1)$. **Ans.** 2,

Q4. If $f = \{(5, 2), (6, 3)\}$, $g = \{(2, 5), (3, 6)\}$, write $f \circ g$, **Ans.** $\{(2, 2), (3, 3)\}$,

Q5. If $A = \{a, b, c, d\}$, and $f = \{(a, b), (b, d), (c, a), (d, c)\}$, show that f is one-one onto from A to A . Find f^{-1} .

Ans. $\{(b, a), (d, b), (a, c), (c, d)\}$,

Q6. Consider the set $A = \{a, b, c\}$, and R be the smallest equivalence relation on A , then find R .
Ans. $\{(a, a), (b, b), (c, c)\}$,

Q7. Let $f: R \rightarrow R$ be the function defined by $f(x) = 4x - 3 \forall x \in R$. Then Find $f^{-1}(x)$. **Ans.** $\frac{x+3}{4}$,

Q8. Consider the set A containing n elements. Then the total number of injective functions from A onto itself is----- **Ans.** $n!$

Q9. Domain of the function $f: R \rightarrow R$ defined by $f(x) = \sqrt{x^2 - 3x + 2}$ is-----, **Ans.** $x \in (-\infty, 1] \cup [2, \infty)$,

Q10. Is the binary operation $*$ defined on set Z (set of integer) by $m*n = m-n+mn \forall m, n \in Z$ commutative and associative? **Ans.** No

Q11. If $f = \{(5, 2), (6, 3)\}$ and $g = \{(2, 5), (3, 6)\}$ Find range of f and g . **Ans.** $\{2, 3\}$ and $\{5, 6\}$.

Q12. Binary operation $*$ defined on set R (set of real numbers) by $m*n = m-n+mn \forall m, n \in R$ then find identity element with respect to $*$ **Ans.** 0

4 marks question

Q13. Let $A = N \times N$ and $*$ be a binary operation on A defined by $(a, b) * (c, d) = (ac, bd) \forall a, b, c, d \in N$ prove that $*$ is both commutative and associative Binary operation on A .

Q14. If R is a relation in $N \times N$ show that the relation R is defined by $(a, b) R (c, d)$ if and only if $ad = bc$ is an equivalence relation.

Q15. Show that the function $f: N \rightarrow N$ defined by $f(x) = x^2 + x + 1, \forall x \in N$ is not invertible.

Q16. If $f(x) = x^2 + 3x + 1, g(x) = 2x - 3, \forall x \in R$ find the value of $f \circ g, g \circ f, f \circ f$ and $g \circ g$,
Ans. $4x^2 - 6x + 1, 2x^2 + 6x - 1, x^4 + 6x^3 + 14x^2 + 15x + 5$ and $4x - 9$.

Q17. A relation $R: N$ to N is given by $R = \{(a, b): b \text{ is divisible by } a\}$. Check whether R is an equivalence relation.
Ans. No

Q18. Prove that the function $f(x) = 2x - 3$, where x is rational number, is bijective function.

P.T.O

6 marks question

Q19. A toy company manufactures two types of dolls, A and B. Each doll of type B takes twice as long to produce as one doll of type A. The company have time to make a maximum of 2000 dolls of type A per day ,the supply of plastic is sufficient to produce 1500 dolls per day and each type requires equal amount of it. Type B requires a fancy dress of which there are only 600 per day available. If the company makes a profit of Rs 3 and Rs 5 per doll, respectively, on doll A and B, How many of each should be produced per day in order to maximize profit? Formulate this LPP and then solve it by graphical method. **Ans.** 1000,500,Rs 5500

Q20. A manufacturer produces Tables and Chairs. It takes 3 hour of work on machine A and 1 hour on machine B to produce Tables. It takes 3 hour on A and 2 hour on machine B to produce Chairs. He earns a profit of Rs 30 per Tables and Rs 48 per package on per Chair. How many items of each should be produced each day so as maximize his profit, if he operates his machines A and B for at the most 18 and 8 hours respectively a day? Formulate this LPP and then solve it by graphical method. **Ans** 4, 2

Q21. An aeroplane can carry a maximum of 200 passengers. A profit of Rs 400 is made on each first class ticket and a profit of Rs 300 is made on each economy class ticket. The airline reserves at least 20 seats for first class. However, at least 4 times as many passengers prefer to travel by economy class than by the first class. Determine how many tickets of each type must be sold in order to maximize the profit for the airline. What is the maximum profit? Formulate this LPP and then solve it by graphical method. **Ans.** 40, 160, Rs 64000

Q22. A man rides his motorcycle at the speed of 25 km/h. He has to spend Rs 2 /km on petrol. If he rides it at a faster speed of 40 km/h, the petrol cost increase to Rs 5 km/h He has at most Rs 100 to spend on petrol and one hour's time. He wishes to find the maximum distance that he can travel. Formulate this LPP and then solve it by graphical method. **Ans.** 30 km.

Q23. There are two factories located one at place P and the other at place Q. From these locations a certain commodity is to be delivered to each of the three depots situated at A, B and C. The weekly requirements of the depots are respectively 5, 5 and 4 units of the commodity while the production capacity of the factories at P and Q are respectively 8 and 6 units. The case transportation per unit is given below:

From / To	Cost (in Rs.)		
	A	B	C
P	16	10	15
Q	10	12	10

How many units should be transported from each factory to each depot in order that the transportation cost is Minimum? What will be the minimum transportation cost? Formulate this LPP and then solve it by graphical method. **Ans.** Rs 155

Q24. A firm manufacturer makes two types of toys X and Y. Three machines are needed for this purpose and the time (in hours) required for each toy on the machines is given below:

Type of toy	Machines		
	I	II	III
X	2	1	1
Y	1	1	3

Each machine is available for a maximum of 70, 40 and 90 hours respectively, if the profit of each toy of type X is Rs.40 and that one each toy of type Y is Rs. 60. How many units of each type should be manufactured to get maximum profit? Formulate this LPP and then solve it by graphical method. **Ans.** X=15, Y=25, Z=2100.

Q25. Two tailors A and B earn Rs 150 and Rs 200 per day respectively. A can stitch 6 shirts and 4 pants per day while B can stitch 10 shirts and 4 pants per day .How many days shall each work , if it is desire to produce at least 60 shirts and 32 paints at a minimum labour cost. Formulate this LPP and then solve it by graphical method. **Ans.** Rs 1350