

- Q1.** Evaluate: **2 Marks**
 $\sin^{-1} \left(\sin \frac{3\pi}{4} \right) + \cos^{-1} \left(\cos \frac{3\pi}{4} \right) + \tan^{-1}(1)$
- Q2.** Prove that $\sin^{-1} (2x\sqrt{1-x^2}) = 2 \cos^{-1} x, \frac{1}{\sqrt{2}} \leq x \leq 1$. **2 Marks**
- Q3.** Check if the relation R in the set of real numbers defined as $R = \{(a, b) : a < b\}$ is (i) symmetric, (ii) transitive. **2 Marks**
- Q4.** Check if the relation R on the set $A = \{1, 2, 3, 4, 5, 6\}$ defined as $R = \{(x, y) : y \text{ is divisible by } x\}$ is (i) symmetric (ii) transitive. **2 Marks**
- Q5.** Prove that: **2 Marks**
 $3 \sin^{-1} x = \sin^{-1}(3x - 4x^3), x \in \left[-\frac{1}{2}, \frac{1}{2} \right]$
- Q6.** A relation R on set $A = \{1, 2, 3, 4, 5\}$ is defined as $R = \{(x, y) : |x^2 - y^2| < 8\}$. Check whether the relation R is reflexive, symmetric and transitive. **3 Marks**
- Q7.** Show that the relation R in the set $A = \{1, 2, 3, 4, 5\}$ given by $R = \{(a, b) : |a - b| \text{ is even}\}$, is an equivalence relation. Show that all the elements of $\{1, 3, 5\}$ are related to each other and all the elements of $\{2, 4\}$ are related to each other. But no element of $\{1, 3, 5\}$ is related to any element of $\{2, 4\}$. **3 Marks**
- Q8.** Three relation R_2 is defined in set $A = \{a, b, c\}$ as follows: **3 Marks**
 $R_2 = \{(a, a)\}$
 Find whether or not the relation R_2 on A is:
 1. Reflexive.
 2. Symmetric.
 3. Transitive.
- Q9.** Let $A = \{1, 2, 3\}$, and let $R_3 = \{(1, 3), (3, 3)\}$. Find whether or not the relations R_3 on A is: **3 Marks**
 1. Reflexive.
 2. Symmetric.
 3. Transitive.
- Q10.** Prove the following results
 $\sin \left(\cos^{-1} \frac{3}{5} + \sin^{-1} \frac{5}{13} \right) = \frac{63}{65}$
- Q11.** Three relation R_1 is defined in set $A = \{a, b, c\}$ as follows: **3 Marks**
 $R_1 = \{(a, a), (a, b), (a, c), (b, b), (b, c), (c, a), (c, b), (c, c)\}$
 Find whether or not the relation R_1 on A is:
 1. Reflexive.
 2. Symmetric.
 3. Transitive.
- Q12.** Three relation R_4 is defined in set $A = \{a, b, c\}$ as follows: **3 Marks**
 $R_4 = \{(a, b), (b, c), (c, a)\}$
 Find whether or not the relation R_4 on A is:
 1. Reflexive.
 2. Symmetric.

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3. Transitive.

Q13. Test whether the following relations R_2 are:

3 Marks

1. Reflexive.
2. Symmetric.
3. Transitive.

R_2 on Z defined by $(a, b) \in R_2 \Leftrightarrow |a - b| \leq 5$

Q14. Solve the following equation:

3 Marks

$$2 \tan^{-1}(\cos x) = \tan^{-1}(2 \operatorname{cosec} x)$$

Q15. Write the following function in the simplest form:

3 Marks

$$\tan^{-1} \left(\frac{3a^2x - x^3}{a^3 - 3ax^2} \right), a > 0; \frac{-a}{\sqrt{3}} \leq x \leq \frac{a}{\sqrt{3}}$$

Q16. A relation R is defined on a set of real numbers R as

5 Marks

$R = \{(x, y) : x \cdot y \text{ is an irrational number}\}.$

Check whether R is reflexive, symmetric and transitive or not.

Q17. Prove that the relation R on Z defined by $(a, b) \in R \Leftrightarrow a - b$ is divisible by 5 is an equivalence relation on Z .

5 Marks

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