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 $\sin^{-1}\left(2x\sqrt{1-x^2}\right)=2\cos^{-1}x, \frac{1}{\sqrt{2}}\leq x\leq 1.$ **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 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| 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:

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.

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 . y 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**