

M.M.

Time: 60 mins

Q1:- Find the number of all one-one functions from set $A = \{x, y, z, w\}$ to itself. (1)

Q2:- Write $\cot^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right)$, $|x| > 1$ in the simplest form. (1)

Q3:- Write the domain and range of ~~$\cos^{-1}x$~~
 $f(x) = \cos^{-1}x$. Also evaluate $\cos^{-1}\cos\left(\frac{7\pi}{6}\right)$. (2)

Q4:- On the set of real numbers find out the identity elements for following operations:-
(a) Addition (b) Sub~~trac~~action (c) Multiplication (d) Division. (2)

Q5:- In the set N of natural numbers, define binary operation $*$ by $m * n = \text{g.c.d.}(m, n)$, $m, n \in N$. Is the operation $*$ commutative and associative? (2)

Q6:- P.T. $\cot^{-1}7 + \cot^{-1}8 + \cot^{-1}18 = \cot^{-1}3$ (2)

OR

Which is greater $\tan 1$ or $\tan^{-1}1$?

(7) Solve for x

$$\tan^{-1}(x+1) + \tan^{-1}(x-1) = \tan^{-1} \frac{8}{31}$$

(4)

(8) Prove that

$$\tan^{-1}\left(\frac{1}{4}\right) + \tan^{-1}\left(\frac{2}{9}\right) = \frac{1}{2} \cos^{-1}\left(\frac{3}{5}\right) = \sin^{-1}\left(\frac{1}{\sqrt{5}}\right)$$

(4)

(9) Let A be the set of all real numbers except -1 and an operation $*$ be defined on A as $a * b = a + b + ab$ for all $a, b \in A$

(4)

(i) Prove that $*$ is commutative and associative.

(ii) P.T. zero is the identity element for $*$

(iii) P.T. every element $a \in A$ has $\frac{-a}{1+a}$ as its inverse

(10) Find $g \circ f$ and $f \circ g$, if:

(i) $f(x) = |x|$ and $g(x) = |5x-2|$

(4)

(ii) $f(x) = 8x^3$ and $g(x) = x^{\frac{1}{3}}$

(4)

(11) Prove that $\tan\left(\frac{\pi}{4} + \frac{1}{2} \cos^{-1} \frac{a}{b}\right) + \tan\left(\frac{\pi}{4} - \frac{1}{2} \cos^{-1} \frac{a}{b}\right) = \frac{2b}{a}$

(12) Show the relation S in the set $A = \{n \in \mathbb{Z} : 0 \leq n \leq 12\}$ given by $S = \{(a, b) : a, b \in \mathbb{Z}, |a-b| \text{ is divisible by } 4\}$ is an equivalence relation. Find the equivalence class [3].

(5)