Indian Statistical Institute
Documentation Research and Training Centre
M.S. (Library and Information Science)
2nd Semester Mid-term Examination (2019-2021)
Paper 12: Elements of Mathematics II

Time: 11.30 AM – 1 PM **Date: 28-02-2020**

You can answer all the questions (Maximum you can score 40 marks)

1) Define with proper statement and example [5x2]
   i. Relation and its types
   ii. Function and its types

2) Define with proper statement and example [2.5x2]
   i. Domain
   ii. Range

3) Find the domain of the function $f(x)= \frac{x^2+3x+5}{x^2-5x+4}$. [5]

$x^2-5x-x+4$
$x(x-4)-1(x-4)$
$(x-1)(x-4)$
$R-\{1,4\}$

4) Consider $f:\{1,2,3\} \to \{a,b,c\}$ given by f(1) = a, f(2) = b, f(3) = c. Find f^{-1} and show that $(f^{-1})^{-1}=f$. [5]

5) If f(x) = $ax+2$, $x \leq 3$
$2x+3$, $x>3$

is continous at x=3 then find the value of **a**. [5]

6) Calculate the limits of the following functions: [10]
   i. $\lim_{x \to 1} \frac{\sqrt{x}-1}{x-1}$
   ii. $\lim_{x \to 0} \frac{1-\sqrt{1+x}}{x}$
   iii. $\lim_{x \to 0} \frac{tanx-sinx}{x^3}$
   iv. $\lim_{x \to 0} 1+x^2+x^3+x^4+x^5$

7) Each questions carry equal marks. [10]

i. Find the equation of line which passes through the points (4,2) and (6,9).

ii. What do you mean by parallel lines?

iii. Find the limit: $\lim_{x \to 1} \sqrt{x^2+8}$

iv. is f(x)= x^3+6 continous at x=0?

v. Find slope of the line that goes through the points (3,2) and (5,8).

$\frac{1}{2}\left(\frac{1-3x}{x}\right)$ $x = \left(\frac{1}{2y+3}\right)$ $y = \frac{1}{2\left(\frac{1}{2y+3}\right)+3}$

$f^{-1}(x) = \frac{1-3x}{2x}$ $= \frac{2y+3}{2+3(2y+3)}$

$y = \frac{2y+3}{2+6y+9}$

$\boxed{y = \frac{2y+3}{6y+11}}$

$f(x) f'(x) = 1$

$\frac{1}{2x+3} \times \frac{1-3x}{2x} \neq 1$