

# Mathematics A-Course (Paper-I)

Attempt FIVE Questions in all. Select THREE Questions from Section-A and TWO from Section-B.

## SECTION-A

1- a) Solve  $|x| + |x - 1| > 1$ . 5

b) Evaluate  $\lim_{x \rightarrow -\infty} \left( \frac{\sqrt{x^2 + 2}}{3x - 6} \right)$  5

2- a) Find K so that the function  $f(x)$  defined by  $f(x) = \begin{cases} Kx^2 & x \leq 2 \\ 2x + K^2 & x > 2 \end{cases}$  is continuous. 5

b) A man 6 ft tall is walking towards a lamp post 16 ft high at the speed of 5 ft / sec.  
 At what rate is the tip of his shadow moving. 5

3- a) Differentiate  $\log_{10} \left( \frac{x+1}{x} \right)$  w.r.t  $x$  5

b) Verify  $f_{xy} = f_{yx}$  when  $f(x, y) = x^y + y^x$  5

4- a) The function  $f(x) = \frac{1}{4}x^2 + 1$  satisfies mean value theorem. Find the number  $c \in ] -1, 4 [$  5

b) Write Maclaurin's Series of the function  $f(x) = \log(1 - x)$  5

5- a) Evaluate  $\lim_{x \rightarrow \pi/2} (\sec x)^{\cot x}$  5

b) Evaluate  $\lim_{x \rightarrow 0} \frac{e^x - e^{\sin x}}{x - \sin x}$  5

## SECTION-B

6- a) Evaluate  $\int \sqrt{\frac{1+x}{1-x}} dx$  5

b) Integrate the function  $\cos(\log x)$  with regards to  $x$ . 5

7- a) Evaluate  $\int \frac{dx}{(x+1)\sqrt{x^2-1}}$  5

b) Evaluate  $\int \frac{\sin x + \cos x}{\tan x} dx$  5

8. a) Compute  $\int_a^b \sin x dx$  by Abinitio 5

b) Show that  $\int_0^{\pi/2} \frac{\sin x - \cos x}{1 + \sin x \cos x} = 0$  5