MATHEMATICS

[Differentiability and Continuity]

Time: - 1hr (Class - XII) **F.M-40**

[8× 5 = 40]

(1): *Show that the function f(x) is discontinuous at* $x = 0$.

$$f(x)=\begin{cases}\dfrac{e^{1/x}-1}{e^{1/x}+1} & when\, x\neq 0\\ 0\ , & when\, x\neq 0\end{cases}$$

(2): *Discuss the continuity of the following function.*

$f(x)=|x-1|+|x-2|$ *at* $x=1$ *and* $x=2$.

(3): *If the following function f(x) defined by*

$$f(x)=\begin{cases}\dfrac{\log(1+ax)-\log(1-bx)}{x}, & if \quad x\neq 0\\ k, & if \quad x=0\end{cases}$$

is continuous at $x=0$, *find* $k=?$

(4): *Determine the value of* a, b, c *for which the function is*

$$continuous\ at\ x=0.\ f(x)=\begin{cases}\dfrac{\sin(a+1)x+\sin x}{x}, & for\ x<0\\ c\ , & for\ x=0\\ \dfrac{\sqrt{x+bx^2}-\sqrt{x}}{bx^{3/2}}, & for\ x>0\end{cases}$$

(5): *Determine the value of k for which the function is continuous*

$$at\ x=2.\ f(x)=\begin{cases}\dfrac{2^{x+2}-16}{4^x-16}, & for\ x\neq 2\\ k, & for\ x=2\end{cases}$$

(6): *Prove that if a function is differentiable at a point , it is necessarily continuous at that point. But the converse is not necessarily true.*

(7): *Examine the differentiabilty of the following function at* $x=1$,

$$f(x)=\left|1-\frac{1}{x}\right|$$

(8): *If* $f(x)=\begin{cases}ax^2-b, if\ |x|<1\\ 1/|x|, if\ |x|\geq 1\end{cases}$ *is differentiable at* $x=1$, *find* a, b.

Ranjan Kumar Mohapatra
e-mail: mahapatra.ranjan@rediffmail.com
mobile: 9437534728

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