(1) Evaluate $\lim\limits_{x \to 0} \dfrac{\sin 3x}{\sin 5x}$ [2m]

(2) Find the derivative of $(\tan x)^{\ln x}$ with respect to x.   [5m]

L·Q
→ Long Question

2m = 2 marks
5m = 5 marks

(3) Examine the continuity of the [L.Q] function $f(x)$ given by

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

(4) If $f(x) = x \tan^{-1} x$, find $f'(\sqrt{3})$ $\boxed{2m}$

(5) Evaluate, $\lim\limits_{x \to 0} \ln (1 + 6x)^{1/x}$ [5m]

(6) Find $\dfrac{dy}{dx}$, if $\ln \sqrt{x^2 + y^2} = \tan^{-1} \left(\dfrac{y}{x}\right)$ [L·Q]

(7) If $f(x, y) = \sin^{-1} (x/y)$, then find f_x and f_y [2m]

(8) If $y = \sin^{-1} x$ then show that $(1 - x^2) y_2 - x y_1 = 0$ [5m]

(9) Evaluate $\int \sec^3 x \cdot \tan x \, dx$ [5m]

(10) Solve $e^x \sqrt{1 - y^2} \, dx + \dfrac{y}{x} \, dy = 0$

(11) Evaluate $\int_0^{\pi/2} \log(1+\tan x)\, dx$ [L·Q]

(12) Determine the Order and degree of the differential Equation. [2m]

$$2\frac{d^2y}{dx^2} + 3\sqrt{1-\left(\frac{dy}{dx}\right)^2} - y = 0$$

(13) Evaluate $\int \frac{dx}{x\sqrt{x^2-a^2}}$ [5m]

(14) Solve $\cos^2 x \frac{dy}{dx} + y = \tan x$ [L·Q]

(15) Differentiate a^x w.r. to x^a [2m]

(16) Evaluate $\lim_{x \to 0} \frac{1-\cos x}{x^2}$ [5m]

(17) find the value of 'k' such that [L·Q]

$$f(x) = \begin{cases} (1-3x)^{1/x} & , x \neq 0 \\ e^k & , x = 0 \end{cases}$$

is Continuous at $x = 0$

(18) find the derivative of $\frac{1}{f(ax+b)}$ [2m]

(19) find $\frac{dy}{dx}$ if $y^x = x^y$ [L·Q]

(20) Evaluate $\int \frac{e^{\tan^{-1}x}}{1+x^2}\, dx$ [2m]

(21) Evaluate $\int_0^{\pi/2} \ln \tan x \, dx$ [5m]

(22) Evaluate $\int \sqrt{x^2-a^2}\, dx$ [L·Q]

(23) Solve $\dfrac{dy}{dx} - y = e^{x}$ [5m]

(24) Evaluate $\int \log x$ [2m]

(25) Evaluate $\lim\limits_{\theta \to 0} \dfrac{\sin 3\theta}{\sin 5\theta}$ [2m]

(26) Find derivative of $\sin^{-1} x$ w.r. to x [2m]

(27) If $u = x^2 y + 3xy^2 - \dfrac{x}{y}$

then find $\dfrac{\partial^2 u}{\partial x \partial y}$

(28) Evaluate $\int\limits_{0}^{3} [x] \, dx$ [2m]

(29) Determine the order and degree of the differential equation. [2m]

$$\dfrac{d^2 y}{dx^2} = \sqrt{1 + \dfrac{dy}{dx}}$$

(30) If $f(x) = \begin{cases} ax^2 + b, & \text{if } x < 1 \\ 1, & \text{if } x = 1 \\ 2ax - b, & \text{if } x > 1 \end{cases}$ [5m]

is continuous at $x = 1$, then find a and b.

(31) Find $\dfrac{dy}{dx}$ if $y = \sin x^{\cos x}$

(32) Find $\dfrac{dy}{dx}$ if $x = \theta + \sin\theta$, $y = 1 + \cos\theta$ at $\theta = \dfrac{\pi}{4}$ [5m]

(33) If $z = f\left(\frac{y}{x}\right)$ [5m]

Show that $x\dfrac{\partial z}{\partial x} + y\dfrac{\partial z}{\partial y} = 0$

(34) Integrate : $\displaystyle\int \frac{e^x + e^{-x}}{e^x - e^{-x}}\, dx$ [5m]

(35) Integrate : $\displaystyle\int x \sin^{-1} x \, dx$ [5m]

(36) Evaluate : $\displaystyle\lim_{x \to 4} \frac{x^2 - 16}{\sqrt{x^2 + 9} - 5}$ [5m]

(37) find $\dfrac{dy}{dx}$ if $y^3 + 3x^2 y - 2x = 10$ [5m]

(38) Integrate $\displaystyle\int \frac{2x^2}{(x-1)(x-2)(x-3)}\, dx$ [5m]

(39) Integrate $\displaystyle\int e^x \left(\frac{1 + \sin x}{1 + \cos x}\right) dx$ [5m]

(40) Solve $(1 + x^2)\, dy + (1 + y^2)\, dx = 0$ [5m]

(41) Integrate $\displaystyle\int \sin^3 x \cdot \sec^{14} x \, dx$ [5m]

(42) Integrate $\displaystyle\int \log(x^2 + 1)\, dx$ [5m]

(43) If $(\cos x)^y = (\sin y)^x$ find $\dfrac{dy}{dx}$ [5m]

(44) Integrate $\displaystyle\int \frac{4x^2 - x + 3}{(x^2 + 1)(x^2 - 1)}\, dx$ [5m]

(45) If $f(x) = mx + c$

$$f(0) = 1, \quad f'(0) = 1 \quad [2m]$$

then find $f(2)$

(46) Integrate $\int \sqrt{1 + \sin 2x} \, dx$ [2m]

(47) If $y = \sin^{-1} \dfrac{x}{y}$ [2m]

find $\dfrac{\partial z}{\partial x}, \dfrac{\partial z}{\partial y}$.

(48) find $\lim\limits_{x \to \frac{\pi}{2}} \left(\dfrac{\pi}{2} - x \right) \tan x$ [2m]

(49) Examine the continuity of

the function defined by

$$f(x) = \begin{cases} \dfrac{|x|}{x} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases} \quad [5m]$$

at $x = 0$

(50) $\lim\limits_{x \to 0} \left(\dfrac{\operatorname{cosec} x - \cot x}{x} \right)$ [5m]

(51) find $\dfrac{dy}{dx}$ if $y = \tan^{-1} \left(\dfrac{\sqrt{1 + x^2} - 1}{x} \right)$ [5m]

(52) Integrate $\int e^{2x} \sin x \, dx$ [5m]

(53) Evaluate $\int_0^{\pi/2} \dfrac{dx}{1+\cot x}$ [5m]

(54) find derivative of
$$\log[\log(\log x)] \text{ w.r.to } x \quad [2m]$$

(55) find $\dfrac{dy}{dx}$ when ————   [5m]
$$x = a \sec^3 \theta$$
$$y = a \tan^3 \theta$$