I-Mid- Term Examination, 2014-2015

Mathematics-1 **Paper Code: AHM-101**

Time: 90 Minutes **Max. Marks: 20**

Section- A

Note: Attempt all questions:- **(1 x 5 = 5 Marks)**

Q.1 Find the n^{th} derivative of $a^x \cos x$.

Q.2 If $x^y + y^x = a^b$ find $\frac{dy}{dx}$.

Q.3 Find the asymptotes parallel to Y-axis for the curve $x^4 + x^2y^2 - a^2\left(x^2 + y^2\right) = 0$.

Q.4 Write the Taylor Series expansion for one variable in ascending power of h.

Q.5 If $u = x f\left(\frac{y}{x}\right) + g\left(\frac{y}{x}\right)$, then find the value of $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2}$

Section- B

Note: Attempt any three questions:- **(2 x 3= 6 Marks)**

Q.1 If $y = \frac{ax+b}{cx+d}$, then find y_n.

Q.2 If $u = e^{x^2+y^2}$ then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 2u \log u$.

Q.3 Prove that $e^x \cos x = 1 + x - \frac{2x^3}{3!} - \frac{2^2x^4}{4!} + \ldots\ldots\ldots\ldots$ by Maclaurin's series.

Q.4 If $w = x^3yz + xy + z + 3$, where $x = 3\cos t$, $y = 3\sin t$ and $z = 2t$, Compute $\frac{dw}{dt}$, at $t = \frac{\pi}{2}$

Section- C

Note: Attempt any three questions:- **(3 x 3 = 9 Marks)**

Q.1 If $y = \sin\left[\log\left(x^2 + 2x + 1\right)\right]$ then prove that $(x+1)^2 y_{n+2} + (2n+1)(x+1)y_{n+1} + \left(n^2+4\right)y_n = 0$

Q.2 If $u = \sin^{-1}\left\{\frac{x^{1/3} + y^{1/3}}{x^{1/2} - y^{1/2}}\right\}^{1/2}$ then prove that $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = \frac{\tan u}{144}\left(\tan^2 u + 13\right)$

Q.3 If $u = f(r)$, $r^2 = \left(x^2 + y^2\right)$ then prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f''(r) + \frac{1}{r} f'(r)$

Q.4 Find the first six terms of the expansion of the function $e^x \log(1+y)$ in a Taylor series in the neighborhood of the point (0,0).