B.A 5th Semester (General) Examination, 2021 (CBCS)
Subject: Mathematics
Course: BAMATH5GE1
(Calculus)

Time: 3 Hours | Full Marks: 60

The figures in the margin indicate full marks.
Candidates are required to write their answers in their own words as far as practicable.
[Notation and Symbols have their usual meaning]

1. Answer any six questions: $6\times5 = 30$

(a) If $y = x^{n-1}\log x$, then show that $y_n = \frac{(n-1)!}{x}$. [5]

(b) If $f(x) = ax^2+2hxy+by^2+2gx+2fy+c$, find f_x and f_y. [5]

(c) If $u = tan^{-1}\frac{x}{y} + sin^{-1}\frac{y}{x}$, evaluate: $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$. [5]

(d) Show that $\int_o^1 \frac{\log(1+x)}{1+x^2}dx = \frac{\pi}{8}log2$. [5]

(e) Find $\int_0^{\frac{\pi}{2}} cos^n\, x\, dx$. [5]

(f) Solve: $2xy dx - (x^2-y^2)dy = 0$. [5]

(g) Solve: $\frac{dy}{dx} = \frac{x+y+1}{3x+3y+1}$. [5]

(h) Solve: $e^x siny\, dx + (e^x + 1)cosy\, dy = 0$. [5]

2. Answer any three questions: $10\times3 = 30$

(a) (i) Find the area enclosed by the curve $a^2x^2 = y^3(2a-y)$. [5]

(ii) Solve : $y(1 + xy)dx - xdy = 0$. [5]

(b) (i) Find the radius of curvature at the origin of the curve $y = x^4 - 4x^3 - 18x^2$. [5]

(ii) Find the condition that the conics $ax^2+by^2=1$ and $a_1x^2+b_1y^2=1$ shall cut orthogonally. [5]

(c) (i) Find the derivative of x^n from first principle. [5]

(ii) Find the asymptotes of the curve $y = e^{ax}$. [5]

(d) (i) Use reduction formula to evaluate $\int_0^{\frac{\pi}{2}} \sin^9 x dx$. [5]

(ii) Show that $\int_0^a f(x)dx = \int_0^a f(a-x)dx$. [5]

(e) (i) Solve $(x^2+y^2)dx - 2xydy = 0$. [4]

(ii) Evaluate $lim_{x\to0}\frac{sinx - tanx}{x^3}$. [6]