Code No: C0306 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH I SEMESTER EXAMINATIONS, APRIL/MAY-2012
BASIC ENGINEERING MATHEMATICS
(BIOTECHNOLOGY)

Time: 3hours **Max.Marks:60**

Answer any five questions
All questions carry equal marks

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1.a) Prove that $\left(\frac{1}{Sec^2\theta - Cos^2\theta} + \frac{1}{Co\sec^2\theta - Sin^2\theta}\right) Sin^2\theta Cos^2\theta = \frac{1 - Sin^2\theta Cos^2\theta}{2 + Sin^2\theta Cos^2\theta}$.

b) If $Sin\alpha = \frac{3}{5}$, $Cos\beta = \frac{9}{41}$, find the value of $Sin(\alpha - \beta)$ and $Sin(\alpha + \beta)$.

2.a) Evaluate $\lim_{x \to 0} \frac{e^{\sin x} - 1}{x}$.

b) Find whether $f(x) = \begin{cases} x^2 when, 0 < x < 1 \\ x, when 1 \le x < 2 \\ \frac{x^2}{4}, when 2 \le x < 3 \end{cases}$
is continuous at x = 1 and x = 2.

3.a) Find the differential coefficient of $\frac{(x-1)}{(x^2+1)}$.

b) Find the differential coefficient of $(2x+1)^4 x\sqrt{x}$.

4.a) Find the length of the normal at any point P of the rectangular hyperbola $x^2 - y^2 = a^2$ and show that it is equal to the distance of P from the origin.

b) Find the length of the subnormal to the curve $x^2 = 4ay$ at (4a, 4a).

5.a) If $u = f(r)$ where $x^2 + y^2 = r^2$ then prove that
$\frac{\partial^2 u}{\partial x^2} = \frac{x^2}{r^2} f''(r) + \frac{(r^2 - x^2)}{r^3} f'(r)$.

b) If $u = \sin^{-1}\left(\frac{(\sqrt{x} - \sqrt{y})}{(\sqrt{x} + \sqrt{y})}\right)$, then prove that
$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0$.

Contd…2

6.a) Evaluate $\int \frac{\log x \log(\log x)}{x} dx$.

b) Evaluate $\int_0^{\pi/2} \log(\tan x) dx$.

7.a) Form the differential equation, from the relation $y = ae^{2x} + be^{-3x} + ce^{x}$.

b) Solve the differential equation $\frac{dy}{dx} = \frac{x-y}{x+y}$.

8. Solve the following differential equations

a) $ye^{y} dx = (y^3 + 2xe^{y}) dy$.

b) $(1+e^{x/y}) dx + (1 - x/y) e^{x/y} dy = 0$.

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