

Roll No.....

BCA-104(O)

B.C.A. (Semester I) Examination – 2011

Paper: Fourth

**Mathematical Foundations of Computer
Science-I**

Time: Three Hours]

[Maximum Marks: 75

Note: Attempt question from all the sections.

Section-A

(Numerical/Analytical/Problematic Questions)

Note: Section A is compulsory.

1. Evaluate:

(i) $\lim_{x \rightarrow 0} \frac{\sqrt{x+25}-5}{x}$

(ii) $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x}\right)^{1/x^2}$

2. Find the area of one petal of the curve: $r = a \sin 3\theta$

Section-B

(5 each)

(Short Answer Type Questions)

Note: Attempt any ten questions.

3. Show that the function $f(x)$ defined by:

$$f(x) = \begin{cases} \frac{\tan^2 4x}{x^2} & \text{for } x \neq 0 \\ 5 & \text{for } x = 0 \end{cases}$$

is discontinuous at $x=0$

4. Find the points of discontinuity of the functions:

$$f(x) = \frac{1}{x((x+4)(x^2-4))}$$
5. Verify Rolle's Theorem for the function:

$$f(x) = x^3 - 6x, x \in [-2, 2]$$
6. Find value of a and b in order that:

$$\lim_{x \rightarrow 0} \frac{x(1+a \cos x) - b \sin x}{x^3} = 1$$
7. Differentiate $\sin x$ from first principle.
8. Differentiate $\tan^{-1} \frac{\sqrt{1-x^2}-1}{x}$ w.r.t $\tan^{-1} x$.
9. Find intrinsic equation of the cardioid

$$r = a(1 + \cos \theta)$$
10. Find maximum and minimum of the function $f(x)$:

$$f(x) = \sin x + \cos 2x$$
11. Evaluate:

$$\int_0^\pi \int_0^{a \sin \theta} a \, d\theta \, dr$$
12. Evaluate:

$$\int_0^a \frac{f(x) \, dx}{f(a-x) + f(x)}$$

Section –C
(Long Answer Type Question)

Note: Attempt any one question.

13. Change order of integration and then evaluate the integral:

$$\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{x \, dx \, dy}{\sqrt{x^2+y^2}}$$

14. Find the c.g of the semi elliptic area bounded by:

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

and (i) its major axis (ii) its minor axis

15. Prove that:

$$\int_0^{\infty} \frac{\log(1+x^2)}{1+x^2} dx = \pi \log_e 2$$