Bachelor of Computer Applications
Annual Examinations – 2006

Paper BCAD – 103
Computer Mathematics

Time allowed: Three hours — Maximum Marks: 100

Q1. Attempt all the questions given below: $16X1\frac{1}{4} = 20$

i) Write down all the subsets of the set {1,2,3}
ii) How many subsets of the letters of the word ALLAHABAD will be formed?
iii) Write De – Morgan's Law.
iv) Show that the binary operation '0' on the set of rational number defined by $a.b = \frac{ab}{2}$ be commutative.
v) In an A.P $T_m = \frac{1}{n}$ and $T_n = \frac{1}{m}$, show that $T_{mn} = 1$.
vi) Find the sum upto infinity of the series

1, 1/2, 1/4, 1/8…………..

vii) tan θ= -4/3. in θ II quad. Find Sin θ and Cos θ.
viii) Evaluate $\lim_{x \to 0} \frac{\sqrt{1+x} - \sqrt{1-x}}{x}$
ix) Show that $\sin^4 \theta + \cos^4 \theta = 1 - 2\sin^2 \theta \cos^2 \theta$
x) Find the n^{th} derivative of sinx.
xi) Define abelian group.
xii) Find $\frac{\sin 45^0 - \sin 30^0}{\cos 45^0 + \cos 60^0}$
xiii) Differentiate x^x w.r.t x/
xiv) Find the distance between the points (1,2) and (3,4)
xv) Find the coordinates of the point which divides the line joining the point (3,4) and (5,6) in the ratio 1:2 internally.
xvi) Find the maximum and minimum value if any of the function $x^{1/x}$.

OR

i) A ={a, b}, B = {3,4}, C = {3,7} find A X (B ∩C)
ii) Define De – Morgan's Laws.
iii) $F(x) = x^2$, $g(x) = x + 5$, find gof(x).
iv) Show that Binary Operation * defined by a*b = a + b – 1, is commutative.

v) Evaluate the postfix form of 21 – 342 ÷ + x.

vi) Find the order of relation $a_n + a_n - 1 = n^2$.

vii) Show that p^~p is contradiction.

viii) Find the dual of x^ (y v 0)

ix) Give example of an equivalence relation

x) Is f(x) = x +2, one – one.

xi) What is the no of spinning trees of K_4.

xii) Define Atom in Boolean – Algebra.

xiii) What is a planar graph?

xiv) Write Cayley's formula for the no. of spinning trees of complete graph K_n.

xv) What are countable sets?

xvi) Define Isomorphism of graph.

Q2. Attempt any five questions 5X6=30

i) A = { 2,3,4,5}, B ={4, 5, 6, 7}, C={5,7,8,9}
Show that A U (B ∩ C) = (A U B) ∩ (A U C)

ii) Show that Intersection of two subgroups is a subgroup.

iii) If H, K are two subgroups of a group G, then HK is a subgroup of G if HK=KH.

iv) Sum of n terms of two APs are in ratio 7n + 1: 4n + 27 find the ratio of n^{th} terms of AP.

v) Differentiate √Sinx from first principle.

vi) If V is finite dimensional & W is a subspace of V, then dim V/w = dim V – dim W.

vii) Test for continuity $f(k) = k \sin \frac{1}{x}$, at k =0

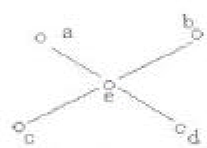
viii) $x^m . y^n = (x + y)^{m+n}$ show $\frac{dy}{dx} = \frac{y}{x}$

OR

i) Let S be a set of triangles & R be the relation R = { (a,b)| a,b ε S, a ≡ b}. Show that R is an equivalence relation.

ii) If f: x →y, g:y→z are 1-1 and onto maps show that a) gof :x→ z is 1-1 and onto if b) $(gof)^{-1} = f^{-1} o\, g^{-1}$.

iii) Prove that if a graph has a Enter Circuit then every vertex, then every of graph has even degree.

iv) Does the graph 

has Hamiltonian circuit.

v) Solve, $a_n - a_m - 1 = 3$, $a_1 = 5$ by summation method

vi) Show that p→ q ≡ p →q

vii) In Boolean Algebra show $(X \wedge Y)' = X' \vee Y'$

viii) Prove that a Boolean Algebra is self dual.

Q3. Attempt any five questions. All questions carry equal marks 5X10=50

i) Prove: $\frac{\sin\theta}{1+\cos\theta} + \frac{\sin\theta}{1-\cos\theta} = 2\operatorname{cosec}\theta$

ii) Differentiate $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$

iii) If $y = (\sin^{-1} x)^2$. Show that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} = n^2 y_n$.

iv) Show that lines $2x-3y+5=0$, $3x+4y-7=0$ & $9x-5y+8=0$ are concurrent.

v) Discuss the continuity of $f(x) = \begin{cases} \frac{xe^{1/x}}{1+e^{1/x}}, & x \neq 0 \\ 0, & x=0 \end{cases}$ at $x = 0$

vi) Show that $\nabla \times (\nabla \times f) = \nabla(\nabla \cdot f) - \nabla^2 f$.

vii) Show that $f(x) = \sin x(1+\cos x)$ is maximum at $x = \pi/3$.

viii) Find $\sin 15^0$