B.C.A. Part–I (Semester–II) (CBCS) Examination

FUNDAMENTALS OF COMPUTATIONAL MATHEMATICS

Paper—2 BCA 4

Time : Three Hours] [Maximum Marks : 80

Note:— (1) All questions are compulsory.

(2) All questions carry marks as indicated.

(3) Draw neat and clear diagram wherever necessary.

1. (A) Choose the correct alternatives : 10

(1) The next iterative value of the root of $x^2 - 4 = 0$ using Newton-Raphson method, if the intial guess is 3, is :

(a) 1.5 (b) 2.067

(c) 2.167 (d) 3

(2) Which of the following is/are components of the process of numerical computing ?

(a) Numerical Method (b) Mathematical Model

(c) Implementation (d) All of the above

(3) Transcendental equation is an equation that contains :

(a) Only Algebraic terms

(b) Directive Methods

(c) Trigonometric ratios, exponential functions, logarithms

(d) None of the above

(4) Which order of polynomials can best be integrated using Trapezoidal Rules ?

(a) 3^{rd} Order (b) 4^{th} Order

(c) 2^{nd} Order (d) 1^{st} Order

(5) A set of linear simultaneous equations may have :

(a) Unique solution (b) No solution

(c) Infinitely many solutions (d) All of the given

(6) Given n+1 data pairs, a unique polynomial of degree _____ passes through the n+1 data points.

(a) n+1 (b) n

(c) n or less (d) greater than n

(7) If P and Z are two sets such that n(P)=19, n(Z)=27 and n(PUZ)=38, then find n(P∩Z)

(a) 6 (b) 5

(c) 8 (d) 7

(8) Two sets are called disjoint if their _____ is the empty set.

(a) Union (b) Intersection

(c) Difference (d) Complement

(9) Degree of a loop in a graph is _____.

(a) 1 (b) 0

(c) 2 (d) 3

(10) For two graphs to be isomorphic, what condition/s should be satisfied ?

(a) equal number of vertices

(b) equal number of edges

(c) equal number of degree of sequence

(d) All of the above

(B) Fill in the blanks : 5

(1) The root of the equation lies between the interval [a, b] if _____.

(2) The basic Gaussian Elimination method is known as the _____ method.

(3) The process of finding the value of the integral of a function of a single variable is known as _____.

(4) _____ is one of the most useful principles of enumeration in combinatorics and discrete probability.

(5) A _____ is an edge that joins a vertex to itself.

(C) Write the answers of the following questions in one sentence : 5

(1) Define continuous data.

(2) Write the Lagrange's Interpolation Formula.

(3) What is Inverse Function ?

(4) Define curve fitting.

(5) What is cut vertex ?

2. (a) Describe the characteristics of numerical computing. 4

(b) Find the root of $f(x) = x^3 - 7x + 1$ with the help of Bisection method. 8

OR

3. (p) Describe the process of Numerical computing. 4

(q) Find the root of $f(x) = 3x^2 - 7x - 1$ using graphical method. 8

4. (a) How will you reduce non-linear equations to linear form ? 4

(b) Find the best fit equation of type $y = ax^b$ for the data given below. 8

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

OR

5. (p) Derive the normal form to fit a second order degree polynomial. 4

(q) Fit the curve $pv^r = k$ to the following data : 8

p(kg/cm^2)	0.5	.1	1.5	2	2.5	3
v(liters)	1620	1000	750	620	520	960

6. (a) Evaluate $\int_0^1 \sqrt{2x+1}\, dx$ using Trapezoidal rule for $n^o = 4$. 4

(b) In the following table, use the Newton Forward Interpalation formula to find : 8

(a) f(2.4)

(b) f(8.7)

x	2	4	6	8	10
f(x)	9.68	10.96	12.32	13.76	15.28

OR

7. (p) Find the value of y if x = 6 and set of values are given as (3, 4), (6, 8), (9, 12) and (12, 16), using Lagrange's interpolation formula. 4

(q) From the following table, find the area bounded by the curve and x-axis from x = 7.47 to x=7.52 using Simpson's 1/3rd and Simpson's 3/8th Rule. 8

x	7.47	7.48	7.49	7.50	7.51	7.52
y	1.93	1.95	1.98	2.01	2.03	2.06

Compute the value of the function f(x) using data above.

8. (a) At a software company, skilled workers have been hired for a project. Out of 75 candidates, 48 of them were software engineers; 35 of them were hardware engineers; 42 of them were network engineers; 18 of them had skills in all three jobs and all of them had skills in at least one of these jobs. How many candidates were hired who were skilled in exactly 2 jobs ? 4

(b) A judge has a jury pool of 40 people that contains 22 women and 18 men. She needs a jury of 10 people. How many juries contain at least 3 women and 3 men ? 8

OR

9. (p) Prove the principle of inclusion and exclusion for two finite sets. 4

(q) Prove that : 8

(a) If A is an infine subset of N then $A \simeq N$.

(b) A set A is countable if and only if there exists a one-to-one function $f : A \rightarrow N$ (not necessarily onto).

10. (a) Prove hand shaking lemma for any connected graph G. 4

(b) Explain the concept of isomorphism and state the conditions to check isomorphism for two graphs with example. 8

OR

11. (p) Prove that the vertex connectivity of any graph G cannot exceed the edge connectivity of G. 4

(q) Explain edge connectivity and vertex connectivity with suitable example. 8