2021

COMPUTER SCIENCE — GENERAL

Paper : DSE-B-3

(Computational Mathematics)

Full Marks : 50

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Answer **question no. 1** and **any four** from the rest.

1. Answer **any five** questions :　　　　　　　　　　　　　　　　　　　　　　　　　　2×5

   (a) What do you mean by planar graph? Give example.

   (b) Suppose there are two simple graphs G1 and G2. How do you verify whether G1 and G2 are isomorphic?

   (c) Define path and circuit.

   (d) Name two direct methods to solve a system of linear equations.

   (e) What are the limitations of Newton–Raphson method?

   (f) State the condition for convergence of an iteration method.

   (g) What is the condition for convergence of Gauss-Seidel method of iteration?

   (h) State the drawback of Simpson's 1/3 rd rule for solving a definite integral.

2. (a) Find $f(1895)$ using Newton's Forward Difference formula

x	1891	1901	1911	1921	1931
$f(x)$	46	66	81	93	101

   (b) State Newton–Raphson formula and criteria for convergence.　　　　　　　　　4+(3+3)

3. (a) What is Absolute error and Relative error? Explain with an example.

   (b) Solve the given equations using Gauss-Jordan method :

   $$x + 2y + 6z = 66$$

   $$3x + 4y + z = 78$$

   $$6x - y - z = 57 \ .$$　　　　　　　　　　　　　　　　　　　　　　　　　　(3+3)+4

4. (a) Prove that the sum of the degrees of the vertices of any finite graph is even.

   (b) A simple graph G has 24 edges and degree of each vertex is 4. Find the number of vertices. Write down the formula used.　　　　　　　　　　　　　　　　　　　　　　　5+5

Please Turn Over

5. (a) Prove that the rate of convergence of Bisection method is linear.

(b) Solve by Gauss elimination method, the following system of equations:

$$2x - y + 3z = 9$$
$$x + y + z = 6$$
$$x - y + z = 2 \ .$$

5+5

6. (a) Define Euler graph and Hamiltonian path with proper examples.

(b) Proof that a simple graph with n vertices and k components can have at most $(n–k) \ (n–k+1)/2$ edges.

(3+3)+4

7. (a) What is the difference between Newton–Raphson and Regula Falsi method? Discuss.

(b) Consider the following dataset :

Temp. in Celsius	140	150	160	170	180
Pressure	3.685	4.854	6.302	8.076	10.225

Find the pressure at 175 degree Celsius using Newton's backward interpolation.

5+5

8. (a) Find a root of an equation $x^3–x–1= 0$ using Secant method correct up to two decimal places.

(b) Find the root of the equation $2x^3–2x–5 = 0$ using Bisection method correct up to 3 places of decimal.

5+5