2017

MATHEMATICS

[Honours]

PAPER – VIII

Full Marks : 60

Time : 3 hours

The figures in the right hand margin indicate marks

[OLD SYLLABUS]

GROUP – A

(*Numerical Analysis*)

[*Marks* : 25]

1. Answer any *two* questions : 8 × 2

   (*a*) What is interpolation ? Derive the error term in polynomial interpolation. 2 + 6

(*b*) Explain the principle of numerical differentiation. Deduce the formula for computing first and second order derivatives of a function $f(x)$ at the first interpolating point x_0. Obtain the error term in Newton's backward differentiation formula, in particular, the error at the starting point. 2 + 3 + 3

(*c*) What types of methods are available in numerical analysis to get the solution of a system of linear algebraic equations ? Describe Gauss-Seidal method for numerical solution of a system of linear equations. State the condition for convergence of this method. 2 + 5 + 1

2. Answer any *two* questions : 4 × 2

(*a*) Discuss modified Euler's method for solving a first order differential equation ? Also explain it geometrically. 4

(*b*) Derive the error term in Simpson's one-third formula in numerical integration in the closed form. 4

(*c*) Explain Newton-Raphson method to find the approximate root of $f(x) = 0$. Hence deduce the rate of convergence of this method. 4

3. Answer any *one* questions : 1 × 1

(*a*) If $u = 3v^7 - 6v$, find the percentages error in u at $v = 1$ if the error in v is 0·05. 1

(*b*) Define 'degree of precision' in connection with numerical analysis. 1

GROUP – B

(*Elements of Computer Science*)

[*Marks* : 35]

4. Answer any *one* question : 15 × 1

(*a*) (*i*) What is the function of full adder with truth table ? Draw a logic circuit of it using NAND gates only. 5

(*ii*) Write a program to convert the polar co-ordinates of a point into the cartesian co-ordimates in two dimension. 5

(*iii*) Explain input and output statements with examples in C or FORTRAN. 5

(*b*) (i) Write an algorithm to sort a finite set of numbers in descending order. 5

(*ii*) Simplify the following Boolean expression : 5

$$X = \acute{A}B(B + C) + BC(\acute{B} + \acute{A}).$$

(*iii*) Discuss conditional statements with examples in either C or FORTRAN. 5

5. Answer any *two* questions : 8 × 2

(*a*) (*i*) What is the difference between canonical form and standard from ? Which form is preferable when implementing a Boolean function with gates ? Which form is obtained when reading a function from a truth table ? Illustrate with examples. 2 + 1 + 1

(*ii*) Write a program C or FORTRAN to find the column norm of a $m \times n$ matrix. 4

(*b*) (*i*) Write a Program in C or FORTRAN to compute ${}^nC_r$ for given integers n and r. 4

(*ii*) Discuss the storage unit in a computer. 4

(*c*) (*i*) If x and y be two Boolean variables, then prove that $x + xy = x$ and $(x + y)' = x'y'$. 2 + 2

(*ii*) Write a program in C or FORTRAN to find the scalar product of two vectors in a n-dimensional space. 4

6. Answer any *one* question : 4 × 1

(*a*) What are differences between (*i*) source program and object program, (*ii*) compiler and interpreter ? 2 + 2

(*b*) Discuss the arithmetic operators with its hierarchy used in C of FORTRAN. 4