PG/IIS/MTM-202/14

M.Sc. 2nd Semester Examination, 2014

APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

(*Numerical Analysis*)

PAPER – MTM - 202

Full Marks : 50

Time : 2 hours

Answer **Q.No.1** and any **two** from the rest

The figures in the right-hand margin indicate marks

1. Answer any *four* questions : 2 × 4

(*a*) What do you mean by single-step and multi-step method to solve a differential equation by numerical method ?

(*b*) Prove that

$$hD \equiv \sin h^{-1}(\mu\delta)$$

where the symbols have their usual meanings.

(*c*) What are the differences between Newton -Cotes quadrature and Gaussian quadrature ?

(*d*) Is LU decomposition method applicable to all system of linear equation ? Explain.

(*e*) Mention the difference of open type and closed type formulae for numerical integration.

2. (*a*) Explain Bairstow method to solve a polynomial equation. 8

(*b*) Deduce three-points Gauss-Chebyshev quadrature formula. Use this formula to evaluate the integral 5 + 3

$$\int_0^1 \frac{e^x + x^2}{\sqrt{1-x^2}}\, dx$$

3. (*a*) Define cubic spline function. Deduce cubic spline interpolation formula [using natural end boundary conditions]. 10

(*b*) Explain successive overrelaxation method to solve a system of linear equations. 6

4. (*a*) Explain Jacobi's method for finding the eigen values and eigen vectors of a real symmetric matrix. 8

(*b*) Describe finite difference method to solve a second order BVP. 8

Or

(*b*) Deduce an explicit finite difference scheme for solving one dimensional heat equation

$$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}, \quad 0 < x < l, \quad t > 0$$

Subject to the condition

$$u(0, t) = u(l, t) = 0, \; u(x, 0) = f(x).$$ 8

[*Internal Assessment* : 10 Marks]