DMM-3343

B. Sc. (Sem. IV) Examination

March/April – 2016

Mathematics : MTH-403

(Old Course) (Numerical Analysis-II)

Time : **2** Hours] [Total Marks : **50**

Instructions : (1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :
☛ **B. Sc. (Sem. IV)**

Name of the Subject :
☛ **Mathematics : MTH-403 (Old)**

☛ Subject Code No. : **3 3 4 3** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Digits to the right indicates marks of the question.
(3) Follow the usual notations.
(4) Use of Scientific non-programmable calcualator is allowed.

Q-1 Answer any five as directed : (10)

(1) Discuss the disadvantage of Lagrange's Interpolation formula and advantage of Divided Difference Interpolation formula .

(2) If $f(0) = -1$ and $f(3) = 2$ then obtain the function f (x) by using Lagrange's Interpolation formula .

(3) If $f(x) = \frac{1}{x}$ then find $[x_0, x_1, x_2]$.

(4) Prove that $[x_0, x_1] = [x_1, x_0]$

(5) Construct divided difference table :

x	0	-1	2	4
f(x)	- 2	-6	4	10

(6) Write the formula to obtain the first derivative at $x = x_0$ and second derivative at $x = x_n$

(7) What is the necessary condition for applying the Simpson rule ?

(8) Define Initial value problem .

Q-2 Answer any two as directed : (10)

(1) Derive Newton's Divided Difference Interpolation formula.

(2) Derive Lagrange's Interpolation formula.

(3) Express the rational function $\frac{3x^2+x+1}{x^3-6x^2+11x-6}$ as sums of partial fraction .

(4) Given the set of tabulated points $(1,-3),(3,9),(4,30)$ *and* $(6,132)$ Satisfying the function $y = f(x)$ compute $f(5)$ using newton's divided difference interpolation formula.

Q-3 Answer any two as directed : (10)

(1) By using Newton's forward formula obtain the formula for numerical differentiation of first order at $x = x_0$.

(2) By using Newton's backward formula obtain the formula for numerical Differentiation of second order at $x = x_n$.

(3) From the following table of values of x and y obtain $\left(\frac{dy}{dx}\right)_{x=2.2}$

x	1.2	1.4	1.6	1.8	2.0	2.2
y	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

(4) From the following table of values of x and y obtain $\left(\frac{d^2y}{dx^2}\right)_{x=1.4}$

x	1.4	1.6	1.8	2.0	2.2
y	4.0552	4.9530	6.0496	7.3891	9.0250

Q-4 Answer any two as directed : (10)

(1) State and prove Simpson's 3/8 rule.

(2) State and prove Trapezodial rule.

(3) Evaluate $\int_0^1 \frac{1}{1+x} dx$ by Trapezodial rule. ($h = 0.125$)

(4) Evaluate $\int_0^1 \sqrt{1-x^2}\ dx$ by taking $h = \frac{1}{6}$.

Q-5 Answer any two as directed : (10)

(1) Obtain the numerical solution of initial value problem $\frac{dy}{dx} = f(x,y)$ by Taylor's series method where $y(x_0) = y_0$

(2) Obtain the numerical solution of initial value problem $\frac{dy}{dx} = f(x,y)$ equation by Picard's method where $y(x_0) = y_0$.

(3) The differential equation $\frac{dy}{dx} = \frac{1}{x^2+y}$ with $y(4) = 4$ obtain y (4.1) and y(4.2) by Taylor's series method .

(4) The differential equation $\frac{dy}{dx} + 2y = 0$ with $y(0) = 1$, use the Euler's method to obtain $y(0.1), y(0.2)$ *and* $y(0.3)$.