Unit-I / FkeâeF-I 6/11

2. (a) Use Newton Raphson method to find a root of the equation $x^3 - 3x - 5 = 0$.
vÙeŠve jHemeve eJeeOe Éejle $x^3 - 3x - 5 = 0$ keâe Skeâ ceue %eele keâeepeS~

(b) Discuss rate of convergence of Newton Raphson method.
vÙeŠve jHemeve eJeeOe keâ keâveJejpevme keâe oj keâe ÛeÛee keâeepeS~

3. (a) Find the polynomial passing through (–4, 1245), (–1,33) (0,5), (2,9) and (5,1335), by the use of Newton's interpolation formula with divided difference.
vÙeŠve FšjheeueMeve e[JeeF[[e[Heâjvme me$e keâe ØeÙeeie keâjle nS (–4, 1245), (–1,33) (0,5), (2,9) Deej (5,1335), me peelee nDee yenheo %eele keâeepeS~

(b) Find Lagrange's interpolating polynomial for the following table.
evecve leeeuekeâe keâ eueS ue«evpe FšjheeueMeve yenheo %eele keâeepeS~

x	0	1	2	5
f(x)	2	3	12	147

A (Printed Pages 8)

Roll No. _____

S-685

B.A./B.Sc. (Part-III) Examination, 2015

MATHEMATICS

(Old Course)

Third Paper

(*Numerical Analysis*)

Time Allowed : Three Hours] ***[Maximum Marks :*** B.A. : 40 / B.Sc. : 75

Note : Attempt only five questions, selecting one question from each unit. Question No. 1 is compulsory. Calculator can be used.
ØelÙekeâ FkeâeF me Skeâ ØeMve Ûevele nS, keâJeue heeÛe ØeMvee keâe nue keâeepeS~ ØeMve me.1 DeeveJeeÙe n~ keâukeâueŠj keâe ØeÙeeie ekeâÙee pee mekeâlee n~

1. Attempt all parts : 16/30
meYee KeC[nue keâeepeS :

(a) Describe bisection method.
yeeF mekemeve eJeeOe keâe JeCeve keâeepeS~

(b) Prove that : $(1+\Delta)(1-\nabla) \equiv 1$

emeæ keâeepeS : $(1+\Delta)(1-\nabla) \equiv 1$

(c) Prove that emeæ keâeepeS :

$$u_0 + \frac{u_1 x}{1!} + \frac{u_2 x^2}{2!} + \ldots = e^x\left[u_0 + \frac{x\Delta u_0}{1!} + \frac{x^2\Delta^2 u_0}{2!} + ---\right]$$

(d) Determine the largest eigenvalue and its eigenvectors for the given Matrix using power method.

veeÛe eoS ieS DeeJÙen keâe meyeme ye[e DeeYeuee#eeCekeâ ceeve SJe Gmekeâ DeeYeuee#eeCekeâ meeoMe %eele keâeepeS~ heeJej eJeeOe keâe ØeÙeeie keâj~

$$A = \begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$$

(e) Find y for x = 0.1 by Euler's method (three steps).

x = 0.1 hej DeeÙeuej eJeeOe Éeje y keâe ceeve %eele keâeepeS (leeve heoe ce)

Given eoÙee n :

$\frac{dy}{dx} = \frac{y-x}{y+x}$; y = 1 at x = 0 . x = 0 hej y = 1

(f) Solve the difference equation :

e[Heâjvme meceekeâjCe keâe nue keâeepeS :

$u_{x+2} - 5u_{x+1} + 6u_x = 0$

(g) Find the best uniform linear approximation to x^4 on [–1,1].

Devlejeue [–1,1] ce x^4 keâe jeKekeâ Gòece mece meeVekeâš %eele keâeepeS~

(h) Find the least square approximation to fit a straight line for the following data:

evecve Deekeâ[e keâ eueS vÙevelece Jeie meeVekeâš %eele keâeepeS pee ekeâ jeKekeâ meceekeâjCe ne:

x	–2	–1	0	1	2
f(x)	15	1	1	3	19

(i) Solve the following using Gauss elimination method :

ieeme eJeuehleekeâjCe eJeeOe Éeje nue keâeepeS :

$2x + y + z = 10$

$3x + 2y + 3z = 18$

$x + 4y + 9z = 16$

(j) Describe boundary value problems of different kinds.

eJeeYeVe Øekeâej keâe meecee ceeve ØeMvee keâe JeCeve keâeepeS~

9. (a) Solve using fourth order method :

ÛelleLe ›eâce eJeeOe Éejle nue keâeepeS~

$y'' = y' + 1,\ y(0) = 1,\ y(1) = e - 1,\ h = 1/3.$

(b) Discuss Newton-Raphson method for the solution of the system of algebraic equations.

yeepeieeCele meceekeâjCee keâe nue keâjve keâ eueS vÙeŠve jHemeve eJeeOe keâe ÛeÛee keâeepeS~

4. (a) Discuss general quadrature formula and have obtain Simpson's 1/3 rule.

meeceevÙe keJee[Ûej me$e keâe ÛeÛee keâeepeS SJe Gmeme emechemeve 1/3 eveÙece %eele keâeepeS~

(b) Use Chebyshev's polynomial to obtain least squares approximation of second degree for $f(x) = x^4$ on $[-1, 1]$.

ÛeJeeMeJe yenheo keâe ØeÙeeie keâjle nS $f(x) = x^4$ keâe $[-1, 1]$ hej eÉleeleeÙe vÙevelece Jeiee keâe meeVekeâŠ %eele keâeepeS~

5. (a) Solve by using Gauss Seidel method :

ieeme-mee[ue eJeeOe Éejle nue keâj :

$$2x - 3y + 10z = 3$$

$$-x + 4y + 2z = 10$$

$$5x + 2y + z = -12$$

(b) Use House Holder's method to reduce the following matrix to a tri-diagonal matrix:

neGme neu[j eJeeOe Éejle evecve DeeJÙen keâe e$eeJekeâCe DeeJÙen ce heejJeelele keâeepeS :

$$\begin{bmatrix} 2 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$

Unit-III / FkeâeF-III 6/11

6. (a) Solve the following using y(0)=1, find y(0.2), h=0.1. Use Runge Kutta method.

y(0)=1 keâe ØeÙeeie keâjle nS y(0.2), h=0.1 keâe ceeve %eele keâeepeS~ jie keâóe eJeeOe keâe ØeÙeeie keâj~

$$\frac{dy}{dx} = y^2 + x$$

(b) Find the derivative of f(x) at x=0.4 (first derivative).

x=0.4 hej f(x) keâe JÙelheVe/DeJekeâue %eele keâeepeS~

(ØeLece JÙelheVe/DeJekeâue)

x	0.1	0.2	0.3	0.4
f(x)	1.10517	1.22140	1.34986	1.49182

7. (a) Describe properties of Chebyshev polynomial $T_n(x)$.

ÛeJeeMeJe yenheo $T_n(x)$ keâ ieCee keâe JeCeve keâeepeS~

(b) Obtain Milne's predictor formula for first order differential equation.

ØeLece ›eâce keâe DeJekeâueve meceekeâjCe keâe nue keâ eueS eceuevee Øee[keš j me$e Øeehle keâeepeS~

Unit-IV / FkeâeF-IV 6/12

8. (a) Solve the boundary value problem

y"– 4y' + 3y = 0 , y(0) = 1, y(1)=0, using second order finite difference method.

meeecele Devlej eÉleele ›eâce eJeeOe Éeje y(0) = 1, y(1)=0 ceevele nS y"– 4y' + 3y = 0 keâe nue keâeepeS~

(b) Discuss Numerov's method for solving second order boundary value problem.

eÉleele meeceele ceeve mecemÙee keâe nue keâjve keâe vÙecejle eJeeOe keâe ÛeÛee keâeepeS~