(j) Find the largest eigen value of the matrix

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

by power method.

heeJej eJeeOe Éeje DeeJÙen

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

keâe GÛÛelece DeeYeue#eeCekeâ ceeve %eele keâeepeS~

Unit-I / FkeâeF-I 6/11

2. (a) Explain Secant's method and find its rate of convergence.

meekeâvš eJeeOe mecePeeFS leLee Gmekeâe DeeYemeeejlee keâe oj %eele keâeepeS~

(b) Using Newton's divided difference interpolation formula find the value of f(6) when following data is given:

vÙešve keâ eJeYeeepele Devlej FCšjheeueMeve me$e keâe ØeÙeeie keâjkeâ f(6) keâe ceeve %eele keâeepeS peyeekeâ evecve Deekeâ[eoÙe nS n :

x	5	7	11	13	21
f(x)	150	392	1452	2366	9702

A (Printed Pages 8)

Roll No. ____________

S-679

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

MATHEMATICS

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~ keâukeâueš j keâe ØeÙeeie ekeâÙee pee mekeâlee n~

1. Attempt all parts : 16/30

meYee KeC[keâeepeS :

(a) Prove that :

emeæ keâeepeS ekeâ :

$$4\mu^2 = 4 + \delta^2$$

(b) Find the value of $\sqrt{17}$ by Newton Raphson method correct upto three decimal places.

vÙešve-jHemeve eJeeOe Éeje $\sqrt{17}$ keâe oMeceueJe keâ leeve mLeeve lekeâ Meæ ceeve %eele keâeepeS~

(c) Prove that the $(n+1)$th forward difference of a polynomial of degree n is zero.

emeæ keâeepeS ekeâ ekeâmee n leeleeÙe yenheo keâe $(n+1)$Jee Dee«ece Devlej MevÙe nelee n~

(d) Show that :

oMeeFÙe ekeâ :

$$u_x = u_{x-1} + \Delta u_{x-2} + \Delta^2 u_{x-3} + - - - - + \Delta^n u_{x-n}$$

(e) By Gauss-Elimination method solve the following system of equations :

ieeme keâ eJeuehleekeâjCe eJeeOe me evecve meceekeâjCe evekeâeÙe keâe nue keâeepeS :

$$2x+2y+4z=14$$

$$3x-y+2z=13$$

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

(f) Find a, b and c such that the formula

$$\int_0^h f(x)\,dx = h\left\{af(0)+bf\left(\frac{h}{3}\right)+cf(h)\right\}$$

is exact for polynomials of as high degree as possible.

a, b leLee c keâe ceeve %eele keâeepeS Ùeeo me$e

$$\int_0^h f(x)\,dx = h\left\{af(0)+bf\left(\frac{h}{3}\right)+cf(h)\right\}$$

GÛÛelece keâeeš, pee ne mekeâlee ne, keâ yenheo keâ eueÙe ÙeLeeleLÙe n~

(g) Using modified Euler's method solve the following differential equation at $x=0.01$ taking $h=0.01$.

heejceeepele DeeÙeuej eJeeOe Éeje $x=0.01$ hej pene $h=0.01$ ne evecve DeJekeâue meceekeâjCe keâe nue keâeepeS:

$$\frac{dy}{dx} = x^2 + y, \quad y(0) = 1$$

(h) Write an algorithm and draw flow chart to get an average of given n numbers.

eoÙe nS n meKÙeeDee keâ Deemele keâe SueieeejLece eueeKeS leLee hueeÛeeš yeveeFÙe~

(i) Write the following expression in 'c':

evecveeueeKele JÙepekeâ keâe 'c' ce eueeKeS:

(i) Area $= \sqrt{s(s-a)(s-b)(s-c)}$

(ii) Energy =

$$\text{Mass}\left[\text{accelaration} \times \text{height} + \frac{(\text{velocity})^2}{2}\right]^2$$

Unit-IV / FkeâeF-IV 6/11

8. (a) Write a program in c to find the sum of first n natural numbers.

c ce ØeLece n Øeekeâe\ekeâ meKÙeeDee keâ Ùeeie keâe %eele keâjve Jeeuee Øee«eece euee KeS~

(b) Write a program in c to find the factorial of any number.

c ce ekeâmee meKÙee keâe ›eâceieCeve %eele keâjve Øee«eece euee KeS~

9. (a) Write a program in c to input and display a matrix.

c ce ekeâmee DeeJÙen keâe eveJeMe leLee ØeoMe keâjve keâe Øee«eece euee KeS~

(b) Write short notes on any two of the following:

evecveeueeKele ce me keâeF oe hej mee#ehle ešhheCee eueeKeS:

(i) Array

(ii) Pointers

(iii) Functions

3. (a) Find f'(1) if:

f'(1) evekeâeueS, Ùeeo :

x	1	2	3	4	5	6
f(x)	1	8	27	64	125	216

(b) Using Lagrange's interpolation formula find a polynomial which passes through the points (0,–12), (1,0) (3,6) and (4,12).

ueeijevpe FCšjheeueMeve me$e keâe ØeÙeeie keâjkeâ eyevoDee (0,–12), (1,0) (3,6) leLee (4,12) Éeje peelee nDee Skeâ yenheo %eele keâeepeS~

Unit-II / FkeâeF-II 6/11

4. (a) Show that the error in Simpson's $\frac{1}{3}$ rule is of order h^4.

oMeeFS ekeâ emechemeve $\frac{1}{3}$ eveÙece ce $eeš h^4 leele keâe nelee n~

(b) By Gauss-Seidel iteration method solve the following system of equations:

ieeme-mee[ue FšjMeve eJeeOe Éeje evecve meceeekeâjCe evekeâeÙe keâe nue keâeepeS :

$$2x - 3y + 20z = 25$$

$$3x + 20y + z = 18$$

$$20x + y - 2z = 17$$

5. (a) Using Jacobi's method, find all the eigen values and corresponding eigen vectors of the following matrix :

pekeâeyee eJeeOe keâe ØeÙeeie keâjkeâ evecveeueeKele DeeJÙen keâ meYee DeeFieve ceeve Je DeeFieve meeoMe %eele keâeepeS :

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

(b) Solve the following system of equations by LU decomposition.

LU Dehelešve Éeje evecve meceekeâjCe evekeâeÙe keâe nue keâeepeS :

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

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

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

Unit-III / FkeâeF-III 6/12

6. (a) Obtain a linear least squares polynomial approximation for $f(x)=x^{3/2}$ on $[0,1]$ when weight function $W(x)=1$.

$f(x)=x^{3/2}$ keâe $[0,1]$ hej jeKekeâ vÙevelece Jeiee keâe yenheo meeVekeâš %eele keâeepeS peyeekeâ Yeej Heâueve $W(x)=1$ n~

(b) Given $\frac{dy}{dx} = \frac{1}{2}(1+x^2)y^2$ and $y(0)=1$, then by Milne's Predictor - corrector method find the value of $y(0.4)$.

eoÙee n $\frac{dy}{dx} = \frac{1}{2}(1+x^2)y^2$ leLee $y(0)=1$ lee eceueve keâ Øee[kešj-keâjkešj eJeeOe Éeje $y(0.4)$ keâe ceeve %eele keâeepeS~

7. (a) Using Runge-Kutta method of fourth order solve the following differential equation at $x=0.2$ taking $h=0.1$:

ÛeleLe ›eâce keâe jiee-keâóe eJeeOe Éeje evecve DeJekeâue meceekeâjCe keâe $x=0.2$ peyeekeâ $h=0.1$ keâ eueÙe nue keâeepeS:

$$\frac{dy}{dx} = x + y^2, \quad y(0) = 1$$

(b) Obtain the Chebyshev linear polynomial approximation to the function $f(x)=x^2$ on $[0,1]$.

Heâueve $f(x)=x^2$ keâe $[0,1]$ hej ÛeyeeMeJe jeKekeâ yenheo meeVekeâš Øeehle keâeepeS~

