Sanjay Ghodawat University, Kolhapur

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FY M Sc	School of Science	Semester I
MTS 507	Numerical Analysis	Marks: 100
12 Dec 2017	End Semester Examination (ESE)	Time: 3 Hrs

Instructions: 1) All questions are compulsory
2) Non-programmable calculator is allowed

		CO	Marks
Q.1	**Select the correct alternative (two marks each)**		
A	Order of Convergence in Newton Raphson method is …………… a) 2 b) 3 c) 0 d) 1	CO1	2
B	If second approximation of root of $x^3+x-1=0$ by fixed point iteration method is 0.8 then $x_3=$ ………… a) 0.78 b) 0.61 c) 0.58 d) 0.79	CO1	2
C	Gauss forward formula is used to interpolate the values of the function for the value of p such that a) $1<p<0$ b) $0<p<1$ c) $-1>p>0$ d) $0>p>1$	CO3	2
D	If h = 1 by Simpson's 3/8 rule $\int_0^3 e^x dx =$………. a) 20.28 b) 21.005 c) 19.28 d) 19.72	CO4	2
E	If $\frac{dy}{dx}$ = x+y, h = 0.2 , y(0) = 0 by Euler's Method ,y(0.4) = ……… a) 0.01 b) 0.02 c) 0.03 d) 0.04	CO5	2
F	If $\frac{dy}{dx}$ = y-x , y(0) = 2 , h = 0.1 by Runge Kutta second order method k_1= ……… a) 0 b) 0.1 c) 0.15 d) 0.2	CO5	2
Q.2	**Attempt any TWO of the following: (ten marks each)**	**CO**	**20**
A	If $\varphi(x)$ is continuous function in interval [a,b] that contains root and $\lvert\varphi'(x)\rvert \leq C < 1$ in this interval then show that the sequence $\{x_k\}$ determined from $x_{k+1} = \varphi(x_k)$, k = 0,1,2,….converges to the root of $x = \varphi(x)$	CO1	10
B	The Jacobi and Gauss Seidel iteration method of the form $X^{(k+1)} = HX^{(k)}+c$ for system of equation AX=B converges to the exact solution for any initial vector	CO2	10

$X^{(0)}$ if $||H|| < 1$

C	Explain Newton-Cote's Formula	CO4	10
Q.3	**Attempt any TWO of the following: (eight marks each)**	**CO**	**16**
A	Prove bound for truncation error in linear interpolation is $\frac{1}{2}\frac{(x_1-x_0)^2}{4}M_2$	CO3	8
B	Obtain Stirling's formula for Derivatives	CO4	8
C	Form formula of Adam-Bashforth Method	CO5	8
Q.4	**Attempt any TWO of the following: (six marks each)**	**CO**	**12**
A	Using Newton Raphson method find the square root of N and hence deduce the value of $\sqrt{8}$	CO1	6
B	Use the Householder's method to reduce the matrix $A = \begin{bmatrix} 4 & -1 & -2 & 2 \\ -1 & 4 & -1 & -2 \\ -2 & -1 & 4 & -1 \\ 2 & -2 & -1 & 4 \end{bmatrix}$ into tridiagonal form	CO2	6
C	Use Stirling formula to find y_{32} from following table	CO3	6

x	20	25	30	35	40	45
y	14.035	13.674	13.257	12.734	12.089	11.309

Q.5	**Attempt any THREE of the following: (four marks each)**	**CO**	**12**
A	Determine the largest eigen value and corresponding vector of matrix $\begin{bmatrix} 2 & 3 & 2 \\ 4 & 3 & 5 \\ 3 & 2 & 9 \end{bmatrix}$	CO2	4
B	Calculate the population of town in 1946 from the table using Gauss Interpolation formula	CO3	4

Year x	1931	1941	1951	1961	1971
Population y in thousands	15	20	27	39	52

C	Tabulate the solution of $\frac{dy}{dx}$ = x+y , y(0) = 0 for 0< $x \leq 0.4$ with h = 0.1 using Milne Method	CO5	4
D	Use Runge –Kutta fourth order method to find the value of y when x = 1 given that y = 1 when x = 0 , $\frac{dy}{dx} = \frac{y-x}{y+x}$	CO5	4
Q.6	**Attempt any FOUR of the following: (seven marks each)**	**CO**	**28**
A	Prove Regula –Falsi method has at least linear rate of convergence	CO1	7
B	State and Prove Brauer theorem	CO2	7
C	Prepare Gauss central difference formula	CO3	7
D	Prepare Newton's Forward Difference Formula for derivative	CO4	7
E	Derive formula for Picard Method	CO5	7