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END SEMESTER EXAMINATION, JUNE - 2019
BCA FOURTH SEMESTER

COURSE CODE:BCA206 COURSE TITLE: COMPUTER BASED NUMERICAL & STATISTICAL TECHNIQUES

[Time allotted: Three hours] **[Max. Marks: 100]**

Note: *Attempt all Sections.*

Section (A)

Q.1. Attempt all questions. **(2 x 10 = 20)**

a. Write Euler's modified formula to solve a differential equation.

b. Rate of convergence of Newton Raphson's Method is…….

c. What is the rate of convergence of bisection method?

d. For a general $n \times n$ matrix the number of multiplication / division for the Gauss-Jacobi method is

(i) $O(n^3/3)$ (ii) $O(n^3/2)$ (iii) $O(n^3/4)$ (iv) $O(n^2)$

e. Prove that , $\Delta = E\nabla = \nabla E$

f. When Gauss elimination method is used to solve $AX=B$, A is transformed into an …….

g. Newton's Backward interpolation formula is used for ……intervals.

h. An equation X^3-4X^2+3X-1 has ……. number of negative roots.

i. Numerical Differentiation is concerned with the method of finding the successive …… of a function at a given argument.

j. To apply Simpson's three by eight rule, the number of intervals must be multiple of …….

Section (B)

Q.2. Attempt any 5 questions. **(7 x 5 = 35)**

a. Find a real root of the equation $x^3+x-1=0$, that lies between 0 and 1, correct to 3D places, using the method of successive approximations.

b. Apply Newtons's Divided difference formula to obtain $d/dx(f(10))$ from the following data:

x:	3	5	11	27	34
f(x):	13	23	899	17315	35606

c. Apply Newton-Raphson method, to calculate the smallest positive root of the equation, $x-e^{-x}=0$, correct to 4D places.

d. Prove that $E=e^{hD}$, where D is a differential operator.

e. Find $\int_0^1 \frac{dx}{1+x^2}$ correct up to 4 decimal places by using Simpson's 1/3rd and Simpson's 3/8 rule with $n=6$. Hence obtain the approximated value of π.

f. Find the solution of initial value problem $\frac{dy}{dx}=\sqrt{x+y}$, $y(0)=1$, for the range $0 \le x \le 0.6$ in steps of 0.2 correct to 4 decimal places, using Euler's modified method.

g. Fit a straight line to the following data by the Least Squares Method:

X:	1	2	3	4	6	8
Y:	2.4	3.1	3.5	4.2	5.0	6.0

Section (C)

Attempt any 3 questions. **(15 x 3 = 45)**

Q.3. **a.** Apply Gauss elimination method with partial pivoting to solve the following system of equations, correct up to 4 decimal places **(10)**

$$6x+8y+2z=24$$
$$3x-2y+10z=9$$
$$12x+2y-2z=14$$

b. Write an algorithm to find a real root of an equation by Regula false method. **(5)**

Q.4. **a.** Make the given system of equations, **(10)**

$$x+20y+9z=30$$
$$2x-7y-20z=-25$$
$$20x+2y+6z=28$$

Diagonally dominant (pivoting) and apply Gauss-Seidel method to solve them, correct up to 3 decimal places.

b. Apply suitable interpolation formula to find the value of $log_{10}301$ from the following table: **(5)**

x:	300	304	305	307
$log_{10}x$:	2.4771	2.4829	2.4843	2.4871

Q.5. **a.** Find $\int_0^1 \frac{dx}{1+x}$ correct up to 5 decimal places by using Trapezoidal and Simpson's 1/3rd rule **(8)** with $h=1/8$. Hence obtain the approximated value of $\log_e 2$.

b. Apply suitable interpolation formula on following observations to find the value of tan 21° **(7)**

θ°:	0	4	8	12	16	20	24
tan θ°:	0	0.0699	0.1405	0.2126	0.2867	0.3640	0.4402

Q.6. **a**. Apply Runge Kutta 4th Order method to evaluate y(0.4) for the differential equation: **(10)**

$$\frac{dy}{dx} = x^2 + y^2,\ y(0) = 1 \text{ and } h=0.1$$

b. Use Lagrange's interpolation method to find the unique polynomial $P(x)$ of degree 2 such that **(5)**

$P(1) = 1$, $P(3) = 27$ and $P(4) = 64$

Q.7. **a.** Obtain a relation of the form $y = a.b^x$ for the following data by the Method of Least Squares: **(10)**

x	2	3	4	5	6
y	8.3	15.4	33.1	65.2	127.4

b. For $x=0.4845*10^0$ and $y=0.4800*10^0$, prove that $\frac{x^2-y^2}{x+y} \neq x-y$ using normalized floating point arithmetic with rounding to 4D term by term from left to right. **(5)**

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