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United College
Kumaripati, Lalitpur
MID TERM EXAM – 2080

Level: BCA (4th Semester)   F.M.: 60
Time: 3 hrs.   P.M.: 24
Course Title: Numerical Methods

Candidates are required to give the answer in their own words as far as practicable.
The figures in the margin indicate full marks.

Group A
Attempt all the questions.   [10*1=10]

1.
i. The bisection method was used to approximate a root of equation $f(x) = 0$, starting from the interval (1,2). It was found that 10th and 11th iteration are $x_{10} = 1.2435$, $x_{11} = 1.2435$
    Then which of the following is correct?
    I) $10 > \ln2 - \ln0.001$
    II) $10 < \ln2 - \ln0.001$
    III) $x_{12} < 1.2436$
    a) a only   b) b only   c) a and c only   d) None

ii. In which of the following method, proper choice of initial value is very important?
    a) Bisection   b) false position   c) Newton-Raphson   d) All

iii. Newton-Raphson method to solve equation has formula.
    a) $x_{n+1} = x_n - \dfrac{f(x_n)}{f^1(x_n)})$ b) $x_{n+1} = x_n - \dfrac{f^I(x_n)}{f(x_n)}$
    c)) $x_n = x_{n+1} - \dfrac{f(x_{n+1})}{f^1(x_{n+1})}$ d) $x_{n+1} = x_n + \dfrac{f(x_n)}{f^1(x_n)}$

iv. In the Gauss elimination method for solving a system of linear algebraic equations, triangularization leads to:
    a) Diagonal matrix   b) Lower triangular matrix
    c) Upper triangular matrix   d) Singular matrix

v. What is the condition required in the factorization method?
    a) Three must exist a diagonal matrix form of the given matrix.
    b) Matrix should not be singular.
    c) All principal minors of the matrix should be non-singular.
    d) Back substitution should be done.

vi. Gauss-Seidal method is also termed as
    a) Iterative method   b) False position
    c) Successive displacement   d) Elimination

vii. Which of the following method is direct method for solving simultaneous algebraic equations?
    a) Relaxation method   b) Gauss-Seidal method
    c) Jacobi's method   d) Gauss-Jordan method

viii. Method of factorization is also known as
    a) LU-decomposition method   b) Triangularization method
    c) both a and b   d) Jacobi method

ix. If λ is an Eigen value of matrix A then the Eigen of A^{-1} is
    a) λ b) $\dfrac{1}{\lambda}$ c) $\dfrac{-1}{\lambda}$ d) None

x. The solution of the set of equation $2x+2y-z = 6$, $x+y+2z = 8$ and $-x + 3y+2z = 8$ and $-x+3y+2z = 4$ is given by:
    a) x = 1, y = 3, z = 2   b) x = 2, y = 3, z = 1
    c) x = 3, y = 1, z = 2   d) x = 1, y = 2, z = 2

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Group 'B'

Attempt any six questions: **(6*5 = 30)**

2. Use power method to find dominant Eigen value and its corresponding
   Eigen vector of $\begin{bmatrix} 2 & 3 \\ 4 & 10 \end{bmatrix}$

3. Use the Jacobi method to approximate the solution of the following
   system of linear equations.
   Continue the iteration until two successive approximate are identical
   when rounded to three significant digits.

   $$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 8 & 22 \\ 3 & 22 & 82 \end{bmatrix}$$

4. Factorize the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 8 & 22 \\ 3 & 22 & 82 \end{bmatrix}$ using Cholesky's method.

5. Find the inverse of the following matrix using the Gauss-elimination
   method.

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

6. Find the inverse by using Gauss-Jordan method:

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

7. Find the root of equation $x^2 - 4x - 10 = 0$ using bisection method where
   root lies between 5 and 6.

8. Use Newton-Raphson method to approximate the root of the function

   $f(x) = x^4 - 4x^3 + 4x^2 + x - 4$ with error less than 0.0001 where $x_0 = 3$

Group C

Attempt any two questions: **(2*10= 20)**

9. Solve the following system using Cholesky method.
   6x + 15y + 55z =76, 15x + 55y + 225z = 295, 55x + 225y + 979z = 1259

10. Solve the following using the factorization method (Do-little's method)
    $5x_1 + 4x_2 + 3x_3 = 28$
    $7x_1 + 4x_2 - x_3 = 20$
    $8x_1 - 5x_2 + 4x_3 = 24$

11. Solve the following equation using Gauss elimination method with
    partial pivoting.
    $0.02x_1 + 5.52x_2 + 2.07x_3 + 0.93x_4 = 10$
    $8.45x_1 + 8.45x_2 + 5.44x_3 + 7.06x_4 = 20$
    $77.89x_1 + 32.56x_2 + 40.67x_3 + 43.45x_4 = 15$
    $9.22x_1 + 40.81x_2 - 143.45x_3 + 17.34x_4 = 25$

ALL THE BEST

Level: BCA (**1V**th **Semester**) F.M.: 60
Time: 3:00 hrs. P.M. 30
Course Title: **Numerical Methods** **Date: 2080/12/07**

Candidates are required to give the answer in their own words as far as practicable. The figures in the margin indicate full marks.

Group A

Attempt all the questions.

1. Tick (✔) the correct answer: **[10x1=10]**

a. Equation $u_{xx} + u_{yy} = 0$ is called:

   i. Elliptic equation iii. Laplace equation
   ii. Parabolic equation iv. Both i) and ii)

b. Which is the simplest method to solve an ordinary differential equation numerically?
   i. Euler's method iii. R-K fourth order method
   ii. Picard's method iv. Taylor series method

c. Standard five-point formula (SFPF) is associated to:
   i. Laplace equation
   ii. Poisson's equation
   iii. Both i) and ii)
   iv. None of these

d. Lagrange's interpolation can be used to interpolate with …….. interval.
   i. Equal
   ii. Unequal
   iii. Both equal and unequal
   iv. Closed

e. In least square method, we use ……. to find the values of coefficients of the required equation.
   i. Normal equations
   ii. Regression equations
   iii. General equations
   iv. Auxiliary equations

f. Numerical techniques more commonly involve
   i. Elimination method
   ii. Reduction method
   iii. Iterative method
   iv. Direct method

g. Simpson's $(3/8)^{th}$ rule is applicable only when:
   i. n is multiple of 3
   ii. n is multiple of 6
   iii. n is multiple of 8
   iv. n is multiple of 24

h. In which of the following methods, we decompose a square matrix as a product of a unit lower triangular matrix and an upper triangular matrix?
   i. Gauss-Jordan Method
   ii. Choleski method
   iii. Crout's method
   iv. Do-little's method

i. Which of the following is an iterative method?
   i. Gauss-Siedel iii. Gauss- Jordan
   ii. Factorization iv. Gauss-elimination

j. what is the other name for factorization method?
   i. Muller's method
   ii. Decomposition method
   iii. Jacobi method
   iv. Gauss-elimination method

Level: BCA (**1st Semester**)   F.M.: 60
Time: 3:00 hrs.   P.M. 30
Course Title: Numerical Methods   **Date: 2080/12/07**
Group B

Attempt any six questions: **[6*5=30]**

2. Fit the curve of the form y=ax+b from the following data set:

x	1	2	3	4	5
y	2	5	9	10	13

3. Find the square root of 3.5 using second order Lagrange interpolation polynomial using the following data table:

x	1	2	3	4	5
F(x)	1	1.4142	1.7321	2	2.2361

4. Solve: $\dfrac{dy}{dx} = x^2 - y$, $y(0) = 2$ for x = 0(0.25)1 using Euler's method.

5. Given that: $\dfrac{dy}{dx} = \dfrac{x^2}{y^2+1}$ with an initial condition y=0, when x=0.
   Use picard's method to find an approximate value of y when x = 0.25, 0.5 and 1, calculate upto second approximation.

6. Find the inverse by using Gauss-Jordan method:
$$A = \begin{bmatrix} 2 & 3 & 4 \\ 4 & 2 & 3 \\ 3 & 4 & 2 \end{bmatrix}$$

7. Using Newton-Raphson method, find the root of the following equation correct to three places of decimal.
   $F(x) = x^3 - x - 4$ and $x_0 = 2$.

8. Factorize the matrix: $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 8 & 22 \\ 3 & 22 & 82 \end{bmatrix}$

Group C
Attempt ANY two questions   **[2*10=20]**

9. Solve the Laplace equation $u_{xx} + u_{yy} = 0$ over the given square grid:

```
                        0   50
        0       50      60      30

100    ┌────┬────┬────┐       10
        │ u₁ │ u₂ │    │
50     │    │ u₃ │ u₄ │       50
        ├────┼────┼────┤
        │    │    │    │
        └────┴────┴────┘       15     90    80
60
```

10. What is matrix factorization. Solve the following system of linear equations using the factorization method. (Do-Little's method).
    $5x_1 + 4x_2 + 3x_3 = 28$
    $7x_1 + 4x_2 - x_3 = 20$
    $8x_1 - 5x_2 + 4x_3 = 24$

11. Evaluate $\int_0^6 \dfrac{1}{1+x^2} dx$ by using i) trapezoidal rule ii) Simpson's $\left(\dfrac{1}{3}\right)$ rule.

ALL THE BEST

Level: BCA   (IVth Semester)   F.M.: 60

Time: 3:00 hrs.   P.M. 24

Course Title: **Database Management System**

Date: 2080/12/04

Candidates are required to give the answer in their own words as far as practicable. The figures in the margin indicate full marks.

Group A

Attempt all the questions.

Tick (✓) the correct answer: [10x1=10]

1. Which of the following is true?
   A. Native users can create their own program.
   B. DBA is also responsible for designing the logical schemas.
   C. Sophisticated users do not write application program code to access the database.
   D. Specialized users do not write database application programs.

2. Weak entity is directly dependent on …..
   A. Strong attribute
   B. Strong relation
   C. Strong entity
   D. Depends on the condition

3. Which of these data models is an extension of the relational data model?
   A. Object oriented data model   B. Object Relational data model.
   C. Semi-Structured data model   D. None of these

4. In unary relational operations, the SELECT operation is partition of relation usually classified as …….
   A. Horizontal partition   B. Vertical partition
   C. Insert partition   D. Delete partition

5. Which of the following is a fundamental operation in relational algebra?
   A. Set operation   B. Natural join
   C. Projection operation   D. Generalized selection

6. Functional dependencies are the types of constraints that are based on …..
   A. Key   B. Key revisited
   C. Superset key   D. None of the mentioned

7. A function that has no partial dependency is in …. form
   A. 1NF   B. 2NF
   C. 3NF   D. 4NF

8. When the primary key is null of a new tuple then the constraint violated is…..
   A. null integrity constraint   B. primary integrity constraint
   C. secondary integrity constraint   D. null value constraint

9. Which of the following is true?
   A. The CHAR data type stores strings that have a fixed length.
   B. The CHAR data type stores strings that have a variable length.
   C. The CHAR data type stores characters that do not have a fixed length.
   D. All of the above

10. Column header of the table in relational model terminology is classified as ….
   A. Attribute   B. Table Starter
   C. Entity   D. Entity domain

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Kumaripati, Lalitpur
PRE - UNIVERSITY EXAM – 2080

Level: BCA   (**IV**th   F.M.: 60
Semester)
Time: 3:00 hrs.   P.M. 24
Course Title: **Database Management System**
Date: 2080/12/04

Group B

Attempt any six questions: [6*5=30]

11. Differentiate between weak entities and strong entities. Explain how any entity can be considered as weak entity.
12. What is extended E-R mode? Explain the concept of specialization with example.
13. Describe the different data types used in ORACLE with the specific size and purpose of each.
14. Why is join performed in relational databases? Explain the difference between Inner join and Outer Join with an example.
15. Define table label and column label constraints in ORACLE. Also, explain different types of constraints that are applied in both labels.
16. What are the different types of SQL? Explain insert, update and delete operation with example.
17. Construct an ER diagram (ERD) to record the marks that students get in different exams of different course offering.

18. Discuss the importance of normalization is DBMS. Describe 1NF, 2NF and 3NF with examples.

Group C

Attempt ANY two questions [2*10=20]

19.
Consider a database system with following schemes;
Restaurant (Rname,Rlocation,Fname)
Cook(Cname,Cspeciality)
Worksat(Cname,Rname,Workinghrs,Shift)
Food(Fname,Cname,Category)
Now write SQL statements and relational algebra statements for following queries
a) Select the name and location of all restaurants.
b) Find the working hours of cook name "Sita".
c) Select name of the food cooked by "Ramesh".
d) Use join to select name of restaurants where food of category "breakfast" is   available.
e) Find the name of cooks who work as "KFC"

20. Normalize the following table upto 3NF:

Sid	Sname	Saddress	Scourse	Ssubject
101	RAM	KTM	BCA	DBMS, MTH
102	Shyam	BHKTPR	BCA	JAVA, DSA
103	Hari	LTPR	BBM	FNC, STAT

21. What is Functional Dependency? Explain all types of functional dependency with proper examples. Also, explain BCNF and 4NF and explain how these differ with 3NF.

ALL THE BEST