

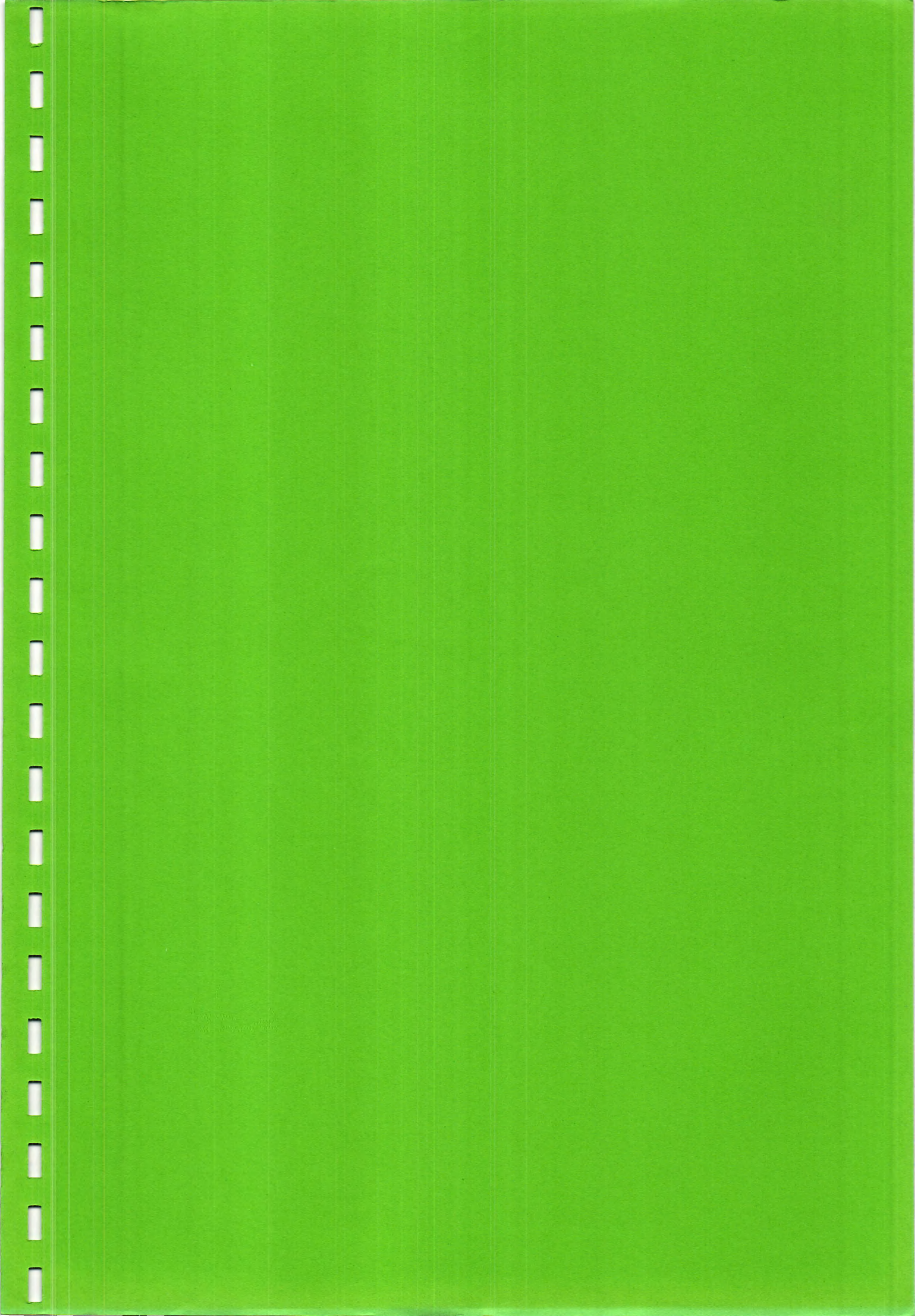
KATHMANDU UNIVERSITY  
End Semester Examination [C]  
July, 2017

Level : B. Sc.  
Year : II

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Marks scored:

Course : MCSC 202  
Semester : II





13. Simpson's 3/8 rule requires the division of the whole range into \_\_\_\_\_ number of subintervals of width  $h$ .  
 a. Multiple of 1      b. Multiple of 2      c. Multiple of 3      d. Multiple of 4
14. The matrix equation  $AX = B$  is consistent if \_\_\_\_\_ where,  $r(A)$  and  $r(A, B)$  are rank of coefficient and augmented matrix.  
 a.  $r(A) > r(A, B)$     b.  $r(A) < r(A, B)$     c.  $r(A) = r(A, B)$     d.  $r(A) = 0$
15. In deriving the trapezoidal formula for the curve  $y = f(x)$  each sub-interval is replaced by its \_\_\_\_\_.  
 a. Chord      b. Straight line      c. Ellipse      d. Tangent line
16. Jacobi and Gauss-Seidel methods are iteration methods for the solution of a system of equation in which \_\_\_\_\_.  
 a. Both Converge equally  
 b. Jacobi converges two times faster than Gauss Seidel  
 c. Gauss Seidel converges two times faster than Jacobi  
 d. Both diverge
17. The shooting method is used to find an approximate solution of \_\_\_\_\_ problems.  
 a. Initial value      b. Boundary value  
 c. First order differential equation      d. Straight equation
18. The rank of the matrix  $\begin{bmatrix} 1 & 5 & 6 \\ 7 & 6 & 8 \\ 1 & 2 & 3 \end{bmatrix}$  equal to \_\_\_\_\_.  
 a. 3      b. 2      c. 1      d. 0
19. Suppose the number be rounded up to 3 decimal places, then absolute error is \_\_\_\_\_.  
 a. 0.05      b. 0.0005      c. 0.00005      d. 0.005
20. While evaluating the definite integral by Trapezoidal rule, the accuracy can be increased by taking \_\_\_\_\_.  
 a. The large number of sub-interval      b. Even number of sub-interval  
 c.  $h = 4$       d. has a multiple of 3

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F. M. : 50

SECTION "C"

[6Q. × 7 = 42 marks]

1. Derive a formula to find the root of an equation  $f(x) = 0$  in Newton- Raphson method . Show that Newton- Raphson method has the order of convergence two. Use Newton- Raphson method to find a root of the equation  $x \sin x + \cos x = 0$  correct to four decimal places with initial guess  $x_0 = \pi$ .
2. What do you mean by interpolation formula? Derive Lagrange interpolation formula. Using the following table find  $f(x)$  as a polynomial of  $x$ .

x	-1	0	3	6	7
f(x)	3	-6	39	822	1611

3. Find the value of the double integral  $\int_{-2}^4 \int_0^4 (x^2 - xy + y^2) dx dy$  using Trapezoidal and Simpson rule and compare the results.
4. State the iteration algorithm for Gauss Seidel Iteration Method and then use it to obtain the solution of the system of linear equations:

$$\begin{aligned} 10x - 2y - z - w &= 3 \\ -2x + 10y - z - w &= 15 \\ -x - y + 10z - 2w &= 27 \\ -x - y - 2z + 10w &= -9 \end{aligned}$$

correct to four decimal places by using initial approximation  $X^0 = (0, 0, 0, 0)$ .

OR

Discuss LU factorization method to find a solution of the system of linear equations. Solve the following system of equation by LU factorization method.

$$\begin{aligned} x + 2y + 3z + 4w &= 10 \\ -x + y + 2z + 3w &= 5 \\ x - y + z + 2w &= 3 \\ -x + y - z + 5w &= 4 \end{aligned}$$

5. Derive the second order Runge-Kutta method. Use second order Runge-Kutta method to solve  $10 \frac{dy}{dx} = x^2 + y^2, y(0) = 1$  for the interval  $0 < x \leq 0.4$  with  $h = 0.1$ .
6. What do you mean by the least squares problem? Determine the constants  $a$  and  $b$  by the method of least square such that  $y = ae^{bx}$  fit the following data.

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.62

SECTION "D"

[4Q. × 2 = 8 marks]

7. Given that  $u = \frac{5xy^2}{z^3} \Delta x, \Delta y, \Delta z$  denote the errors in  $x, y$  and  $z$  respectively such that  $x = y = z = 1$  and  $\Delta x = \Delta y = \Delta z = 0.001$ , find the relative maximum error in  $u$ .
8. Show that  $\mu^2 = 1 + \frac{1}{4}\delta^2$ .
9. Find Euclidean and column norm of the given matrix:  $A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \\ 3 & 1 & 2 \end{bmatrix}$ .
10. A rod is rotating in a plane about one of its ends, if the following table gives the angles  $\theta$  radian through with rod has turned for different values of time  $t$  seconds. Find its angular velocity at time  $t = 0.2$ .

t(in sec)	0.2	0.4	0.6	0.8
$\theta$ ( in radians)	0.12	0.48	0.10	2