



12. The relative error  $E_R$  of the number 1.25 if all of its digits are correct is \_\_\_\_\_.  
 [0.004; 0.0004; 0.00004; 0.4]
13. The secant method has order of convergence \_\_\_\_\_.  
 [1.861; 1.816; 1.618; 1.681]
14. Newton-Raphson method is also called \_\_\_\_\_.  
 [Tangent method; Chord method; Diameter method; Secant method]
15. To find the root of equation  $f(x) = 0$  in  $(a, b)$  using the false position is given by the formula \_\_\_\_\_.  
 [ $\frac{af(a)-bf(b)}{f(b)-f(a)}$ ;  $\frac{af(b)-bf(a)}{f(a)-f(b)}$ ;  $\frac{af(a)-bf(b)}{f(a)-f(b)}$ ;  $\frac{af(b)-bf(a)}{f(b)-f(a)}$ ]
16. Bessel's formula for interpolation gives the most accurate result for \_\_\_\_\_, where the symbol has its usual meaning.  
 [ $0 \leq p \leq 1/4$ ;  $1/4 \leq p \leq 3/4$ ;  $-1/4 \leq p \leq 1/4$ ;  $-1/4 \leq p \leq 0$ ]
17. Lagrange interpolation coefficient satisfies the property \_\_\_\_\_.  
 [ $l_1(x_1) = 0$ ;  $l_1(x_2) = 1$ ;  $l_2(x_1) = 1$ ;  $l_1(x_1) = 1$ ]
18. For given initial value problem  $\frac{dy}{dx} = -y$ ,  $y(0) = 1$ , the value of  $y(1)$  with step size  $h = 1$  using Euler's method is \_\_\_\_\_.  
 [0; 1; 2; 3]
19. Simpson's 1/3 rule requires the division of the whole range into \_\_\_\_\_ number of subintervals of width  $h$ .  
 [multiple of 1; multiple of 2; multiple of 3; multiple of 4]
20. For a given matrix  $A = \begin{pmatrix} 1 & 5 \\ 7 & -3 \end{pmatrix}$ ,  $\|A\|_\infty =$  \_\_\_\_\_.  
 [8; 7; 6; 5]

KATHMANDU UNIVERSITY  
End Semester Examination  
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Level : B.E./B.Sc./B.Tech.  
Year : II  
Time : 2 hrs. 30 mins.

Course : MCSC 202  
Semester: II  
F.M. : 50

SECTION "C"  
[6Q. × 7 = 42 marks]

1. Prove that iteration method converges linearly. Solve the following equation using fixed point iteration method correct to 4 decimal places using initial approximation  $x_0 = 3$ : [3+4]

$$x = \ln(4 + x - x^2)$$

**OR**

- Prove that Newton's method converges quadratically. Solve the following equation using Newton's method correct to 4 decimal places using initial approximation  $x_0 = 7$ : [3+4]

$$e^x + x^2 - x - 4 = 0$$

2. Derive Newton's divided difference interpolation formula. Find a polynomial that passes through the points  $(-3, -23), (1, -11), (2, -23), (5, 1)$  and estimate the value of  $y$  at  $x = 3$  [3+3+1]
3. Describe least square curve fitting process of a linear curve  $y = a + bx$ . The velocity  $V$  of a liquid is known to vary with temperature according to quadratic law  $V = a + bT + cT^2$ . Find the value of  $a, b$  and  $c$  for the following data: [3+4]

$T$	1	2	3	4	5	6	7
$V$	2.31	2.01	1.80	1.66	1.55	1.47	1.41

4. Discuss Gauss-Seidel method and its convergent criteria for the solution of a linear system. Solve the following system of equations starting with the initial vector  $(0,0,0)$  correct to 4 decimal places: [2+1+4]

$$\begin{aligned} 5x + y + 2z &= 10 \\ -3x + 9y + 4z &= -14 \\ x + 2y - 7z &= -33 \end{aligned}$$

5. Solve the boundary value problem:  $y'' + 3y' = x^2 + \sin(x)$ ,  $y(-5) = 10$ ,  $y(13) = 23$ , using finite difference method with step size  $h = 4.5$  [7]

6. Derive Simpson's 1/3 formula to compute the value of a definite integral  $I = \int_a^b y(x)dx$ . Use Simpson's formula to compute the integral  $I = \int_{-1}^1 \frac{\cos x}{\sqrt{1-x^2}} dx$  by taking 10 strips. [3+4]

SECTION "D"  
[4Q. × 2 = 8 marks]

7. Find  $(\Delta u)_{max}$  if  $u = 5xy^2/z^3$  at  $x = 2.23, y = 0.45$  and  $z = 9.72$ , where the values of  $x, y$  and  $z$  are correct to two decimal places.

8. Find  $dy/dx$  at  $x = 1$  from the following table values:

x	1	5	9	13
y	200	154	112	90

9. Given  $\frac{dy}{dx} = y - x$ ,  $y(0) = 2$ . Estimate  $y(2)$  using Runge-Kutta second order method (Total no. of subintervals:  $n = 2$ ).

10. Find  $f(0.26)$  from the following table of values :

x	0.15	0.20	0.25	0.30
y	0.1511	0.2027	0.2553	0.3093