KATHMANDU UNIVERSITY
End Semester Examination
March/April 2017

Marks Scored:

Level :B. Sc.
Year : II

Course : MCSC 202
Semester: II

Exam Roll No. :

Time: 30 mins

F. M. : 10

Registration No.:

Date : MAR 30 2017

SECTION "A"
[10 Q. × 0.5 = 5 marks]

Fill in the blank space(s) by writing the most appropriate word(s) or symbol(s).

1. The number 0.0456000 has _____ significant digits.

2. If the number $X = 1.325$ is correct to three decimal places, then greatest absolute error (ΔX) is _____.

3. Stirling formula for interpolation gives the most accurate result for p in the interval _____.

4. The process of minimizing the sum of the squares of the errors is called _____ method.

5. Simpson's rule requires the division of whole interval into a (an) _____ number of sub-intervals.

6. The rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 3 & 2 & 1 \end{bmatrix}$ is _____.

7. If E be the shift operator, then $E^n y_r =$ _____, where the symbol has its usual meaning.

8. For an initial value problem $y' = x + y^2$ subject to the condition $y(0) = 1$, the Picard's method of successive approximations $y^{(1)}$ is _____.

9. Gauss Siedel method converges _____ as fast as the Jacobi method.

10. Newton's forward difference formula for $y = f(x)$ gives $\left[\frac{dy}{dx}\right]_{x=x_0} =$ _____.

SECTION "B"
[10 Q. × 0.5 = 5 marks]

Fill in the blank space(s) by selecting the most appropriate answer from among the given ones. (*Do not tick the answer*).

11. If $y = 3x^7 - 6x$, then the relative error in y at $x = 1$ when error in x is 0.05, is _____.
[0.05; 0.25; 0.5; 1]

12. The false position method is finding roots of non-linear equations which falls under the category of a (an) _____ method.
[Open; Bracketing; Random; Graphical]

13. The number of iterations in the bisection method to find a solution of the equation $f(x) = 0$ on an interval $[0, 1]$ with a tolerance $\epsilon = 0.001$, is _____.
[10; 5; 2; 1]

14. The technique for computing the value of the function inside the given argument is called _____.
[Extrarpolation; Interpolation;
Fitting; Inspection]

15. Lagrange's interpolation formula is used for the arguments which are _____ spaced.
[uniquely; equally; unequally; distictly]

16. Taylor's series method is used to solve _____.
[Boundary value problem; Real valued problem;
Initial value problem; Complex valued problem]

17. $1 + \Delta =$ _____ where the symbols have their usual meanings.
[E^{-1}; ∇; E; δ]

18. For the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$, the infinity norm $\|A\|_\infty =$ _____.
[9; 16.88; 18; 24]

19. In fitting a straight line of the form $Y = a_0 + a_1 x$, one of the two normal equations is given by _____.
[$ma_0 + a_1 \sum x_i = \sum y_i$; $ma_0 + \sum x_i + a_1 \sum x_i^2 = \sum x_i y_i$;
$a_0 + a_1 \sum x_i = \sum y_i$; $a_o + \sum x_i^2 = \sum x_i y_i$]

20. The shooting method is used to find an approximate solution of _____ problems.
[Initial value problem; Boundary value problem;
Difference equation; Linear Equations]

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MAR 3 0 2017

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Year : II
Time : 2 hrs. 30 mins.

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F.M. : 50

SECTION "C"
[6 Q. × 7 = 42 marks]

1. Discuss Newton-Raphson Method to find the solution of the equation $f(x) = 0$. Also, use it to find a root of the equation $xsinx + \cos x = 0$ correct to 4 – decimal places with the initial guess $x_0 = \pi$. [4 + 3]

2. Evaluate the double integral $\int_0^1 \int_0^1 e^{x+y} dx\, dy$ using the trapezoidal and Simpson's rules taking $h = k = 0.5$. Also, compare the results with the exact solution. [3+3+1]

3. Derive the formula to find the solution of initial value problem $\frac{dy}{dx} = f(x,y),\ y(x_0) = y_0$ by Euler's method. Also, use it to find $y(0.04)$ if $y' = -y$ with $y(0) = 1$and $h = 0.01$. [3+4]

4. Define a triangular matrix. Solve the system of equations: $2x + y + z = 4, x - 2y + 4z = 3,\ x + 3y - 2z = 2$ using LU decomposition method. [1+6]

5. Derive Lagrange's Interpolation formula. For corresponding pair of values of x and $\log_{10} x$ defined as (300, 2.4771), (304, 2.4829), (305, 2.4843) and (307, 2.4871), find $\log_{10} 301$. [4+3]

OR

Derive Newton's forward difference interpolation formula. Use this method to determine the value of $f(0.23)$from the following set of tabulated values: [3+4]

x	0.20	0.22	0.24	0.26	0.28	0.30
$f(x)$	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

6. Define a boundary value problem. Use finite difference method to determine $y(0.5)$ if $y'' + y + 1 = 0,\ 0 \le x \le 1$ with $y(0) = 0, y(1) = 0$ and$h = 0.5$. [1+6]

SECTION "D"
[4 Q. × 2 = 8 marks]

7. Show that$\mu^2 \equiv \frac{1}{4}(\delta^2 + 4)$,where the symbols have their usual meanings.

8. If $u(x, y, z) = \frac{5xy^2}{z^3}$ and errors in x, y, z be 0.01, compute the maximum absolute error and relative error in evaluating u when $x = y = 1$.

9. Evaluate $\frac{dy}{dx}$ at $x = 1.2$ from the following table:

x	1.0	1.2	1.4	1.6	1.8
y	2.7183	3.3201	4.0552	4.9530	6.0496

10. Fit a straight line of the form $Y = a_0 + a_1 x$ to the data points (0, 1), (1, 2.9), (2, 4.8), (3, 6.7), (4, 8.6).