

U.G. 5th Semester Examination - 2020**COMPUTER SCIENCE****[HONOURS]****Discipline Specific Elective (DSE)****Course Code : COM.SC-H-DSE-L-502****(Numerical Methods)**

Full Marks : 60

Time : $2\frac{1}{2}$ Hours*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.***GROUP-A**Answer any **ten** of the following questions : $2 \times 10 = 20$

1. a) State fourth order Runge-Kutta formula.
- b) What is the difference between Newton's method and the Secant method?
- c) Is Simpson's Method faster than the Trapezoidal method? Which one is more reliable?
- d) We wish to solve $x^2 - 2 = 0$ by Newton-Raphson technique. If initial guess is $x_0 = 1.0$, then what will be subsequent estimate of x (i.e. x_1)?
- e) What is the order of errors in the Simpson's rule for numerical integration with a step size h .
- f) A quadratic equation $x^2 - 4x + 4 = 0$ is defined with an initial guess of 3 and 2.5. Find the approximate

root in the first iteration using secant method.

- g) If $\Delta f(x) = f(x+h) - f(x)$, then a constant k , what will be the value of Δk ?
- h) When is Gauss Elimination used?
- i) What do you mean by Absolute error and Relative error?
- j) Is Simpson's method always better than Trapezoidal?
- k) When is Gauss elimination used?

GROUP-BAnswer any **four** of the following questions: $5 \times 4 = 20$

2. Find the missing term in the following: 5

x	1	2	3	4	5
f(x)	7	13		21	37

3. Integrate the function tabulated below by Simpson's $1/3$ rule. 5

x	1	1.5	2	2.5	3	3.5	4
f(x)	2	2.4	2.7	2.8	3	3.6	2.4

4. Using method of false position, find a real root of the equation 5
 $f(x) = x^3 - 3x - 5 = 0$ up to 4 decimal places.
5. Derive second order Runge-Kutta formula. 5

[Turn Over]

6. Solve the system of linear equations: 5

$$x - y + 5z = 5$$

$$2x - 3y + z = 0$$

$$x + 3y + 7z = 11 \text{ using LU decomposition method.}$$

GROUP-C

7. Answer any **two** of the following questions: $10 \times 2 = 20$

- a) Find a root of the equation $x^3 - 3x + 1.06 = 0$ by bisection method correct up to three decimal places. Establish Newton forward interpolation formula. 5+5=10

- b) Use Gauss elimination method to solve the following system of linear equations: 10

$$3x - 2y + 2z = 12$$

$$x + 2y + 3z = 11$$

$$2x - 2y - z = 3$$

- c) Find the cube root of 10 by Newton-Raphson method. 10

- d) Apply Runge-Kutta method of order 4 to solve $dy/dx = x + y$, where $y(0) = 1$, find the value of y at $x = 0.1$ and 0.2 . 10
