



18-12-2015

**DOON UNIVERSITY, DEHRADUN****Final Semester Examination, First Semester, 2015****School of Technology****Class: M.C.A.****Course: CBNST****Semester: III****Course Code: STM-518****Time Allowed: 3Hours****Maximum Marks: 60****Note: Attempt all six questions in Section A. Each question carries 2 marks.****Attempt any four questions in Section B. Each question carries 6 marks.****Attempt any three questions in Section C. Each question carries 8 marks.****SECTION: A****(Very Short Answer Type Questions)****(Marks: 6X2=12)**

1. Find the real root of the equation  $x^2 + 4 \sin x = 0$  correct to three decimal places by using Newton's Raphson method.
2. Solve the following system of equation using Crout's method.  
$$5x + 2y = 16$$
$$3x - y = 3.$$
3. If  $y' = x + y$ ,  $y(0) = 1$  then by Picard's method, the value of  $y^{(2)}(x)$  is.....
4. Estimate the missing term in the following table:

$x$	0	1	2	3	4
$f(x)$	1	3	9	--	81

5. Show that  $\Delta \nabla = \Delta - \nabla$ .
6. If  $f(0) = 1, f(1) = 2.7, f(2) = 7.4, f(3) = 20.1, f(4) = 54.6$  and  $h = 1$ , then the value of  $\int_0^4 f(x) dx$  by Simpson's  $\frac{1}{3}$ rd rule is.....

**SECTION: B****(Short Answer Type Questions)****(Marks: 4X6=24)**

1. Find a root of the equation  $x^3 - 2x - 5 = 0$  using secant method correct to three decimal places.
2. Given the values:

$x$	654	658	659	661
$f(x)$	2.8156	2.8182	2.8189	2.8202

evaluate  $f(656)$  using Lagrange's interpolation formula.

3. Find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  at  $x = 50$  from the following table:

$x$	50	51	52	53	54	55	56
$f(x)$	3.6840	3.7084	3.7325	3.7563	3.7798	3.8030	3.8259

4. Using Runge-Kutta method of fourth order, solve  $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$  with  $y(0) = 1$  at  $x = 0.2$ .
5. Using Milne's predictor-corrector method find  $y(4.4)$  given  $5xy' + y^2 - 2 = 0$  and  $y(4) = 1, y(4.1) = 1.0049, y(4.2) = 1.0097, y(4.3) = 1.0143$ .

**SECTION: C**  
**(Long Answer Type Questions)**

*(Marks: 3X8=24)*

1. Derive Gauss forward central difference interpolation formula and using it, find the value of  $f(1.17)$  using following data.

$x$	1.00	1.05	1.10	1.15	1.20	1.25	1.30
$f(x)$	2.7183	2.8577	3.0042	3.1582	3.3201	3.4903	3.6693

2. Solve the following by Euler's modified method:  
 $\frac{dy}{dx} = \log(x + y), y(0) = 2$  at  $x = 1.0$  with  $h = 0.2$ .
3. Derive general Newton-cotes quadrature formula. Also evaluate  $\int_0^{1.5} e^{-x^2} dx$  using  
(i) Trapezoidal's rule (ii) Simpson's  $\frac{1}{3}$ rd rule and (iii) Simpson's  $\frac{3}{8}$  rule.
4. Solve the following system of linear equations by Gauss-Jacobi method correct to three decimal places.
- $$\begin{aligned} 27x + 6y - z &= 85 \\ x + y + 5z &= 110 \\ 6x + 15y + 2z &= 72. \end{aligned}$$