Paper / Subject Code: 31701 / Computer Programming & Numerical Methods

15-Nov-2019   1T00525 - T.E.(Chemical Engineering)(SEM-V)(Choice Base) / 31701 - Computer Programming & Numerical Methods   76605

(3 Hours)   **[Total Marks: 80]**

N.B.

1. Question No. 1 is Compulsory.

2 Attempt any **Three** Questions from remaining **Five** Questions

3. Assume Suitable Data if needed and Justify the Same

4. Figures to the right indicate full marks.

Q.1

a) What are different conditional Loop in Python? Explain any one with example **[05]**

b) Use secant method to find the root of equation $f=4(x-1)^3$ with $0.4 \leq x \leq 1$. **[05]**

c) Write short note on Successive Substitution Method **[05]**

d) Solve $\frac{dy}{dx} = \frac{1}{2}xy$, y(0)=1, y(0.1)=1.01, y(0.2)= 1.022, y(0.3)=1.023 and h=0.1 find the value of $y(0.4)_p$ and $y(0.4)_c$ by Adam-Bashforth Method **[05]**

Q.2

a) The spherical storage tank containing oil has a diameter of 6 ft. Calculate the height h to which a dipstick 8 ft long would be wet with oil when immersed in the tank when it contains 4 ft^3 of oil. The equation that gives the height, h, of the liquid in the spherical tank for the given volume and radius is given by $V = \frac{3\pi h^2(3r-h)}{9}$, Use the Bisection Method to find the height (h), to which the dipstick is wet with oil. **[10]**

b) Write a short note on one dimensional steady state diffusion with example. **[10]**

Q.3

a) Solve the following system by LU decomposition **[10]**

$$\begin{bmatrix} 1 & -1 & 2 \\ 2 & -2 & 3 \\ 1 & 1 & 1 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} -8 \\ -20 \\ -2 \end{bmatrix}$$

b) Solve the following systems of equations by Gauss Jorden Method **[10]**
$5x_1+2x_2+x_3=12$, $x_1+4x_2+2x_3=15$, $x_1+2x_2+5x_3= 20$

Q.4

a) if , $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$,y(0)=1,h=0.2 find y(0.4)=? **[10]**

By using runge kutta order 4 method

b) Calculate the volume of superheated steam at 100atm and 350 ^{0}C using the equation **[10]**

$\left(P + \frac{a}{v^2}\right)(v - b) = RT$, Newton Raphson Method, for initial value of v use ideal gas equation.

where, $a = \frac{27R^2T_c^2}{64P_c}$, $b = \frac{RT_c}{8P_c}$, T_C=647.11K, P_c=220.76 atm.

Q.5

a) Define diffrence equation and Solve the following Diffrence Equation **[10]**
$y_{n+2} - 3y_{n+1} + 2y_n = 3^n + 7^n$

b) Solve the following set of equations using Newton method **[10]**
$x_1^2 + x_2^2 - 17 = 0$
$2x_1^{1/3} + x_2^{1/2} - 4 = 0$
Start at a value of x=[2.5 0.2]^T and show two iterations.

Q.6

a) A volume and level in gravity flow tank system is given by following equations, **[20]**
$\frac{dV}{dt} = 0.0107h - 0.00205V^2$ $\frac{dh}{dt} = 0.311 - 0.062V$

Where,

V in cu. ft and h in ft and time in sec.

The parameters and variables are given as given below.

V= tank volume ,(at t=0, 3.4 cu.ft.)

h= lavel in tank, (at t=0, 20.5 ft.)

Find the level and volume after 60 Sec using Runge kutta fourth order method.

Use 20 sec as step size.

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