B. Tech. Sixth Semester (Food, Pulp & Paper, Oil & Paint and Petro. Tech.) (CGS)

11044 : Computer Programming & applications : 6 CT 02

P. Pages : 2 | AU - 2814

Time : Three Hours | Max. Marks : 80

* 0 7 4 6 *

Notes : 1. Answer **three** question from Section A and **three** question from Section B.
2. Assume suitable data wherever necessary.
3. Illustrate your answer necessary with the help of neat sketches.
4. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION - A

1. If water is drained from vertical cylindrical tank by opening valve at base, the rate at which water level (h) drops is given by **13**

$$\frac{dh}{dt} = -k\sqrt{h}$$

where k is constant depending upon various factors like shape of valve, diameter of valve, etc. If $k = 0.06$ and initial level is 3 m, find h after every half minute (use any one of numerical method you learned)

OR

2. The rate of cooling of body is expressed as **13**

$$\frac{dT}{dt} = -k(T - T_o)$$

where T is temperature, t is time. T_o ambient temperature, which is constant. K is constant depend upon the surrounding conditions.

If initial temperature of body is 110°C and surrounding temp is 10°C, K = 0.2 (min^{-1}). Compute the temperature of body after every one minute time intervals upto 5 min. Use Eulers method.

3. Three reactors are connected in series, concentration of component A in each reactor is represented by C_1, C_2 & C_3 following system of equation is obtained for this process. **13**

$$17C_1 - 2C_2 - 3C_3 = 500$$
$$-5C_1 + 21C_2 - 2C_3 = 200$$
$$-5C_1 - 5C_2 + 22C_3 = 30$$

Compute C_1, C_2 & C_3 using Gauss elimination method.

OR

4. Solve : **13**

$$x_1 + x_2 - x_3 = -3$$
$$6x_1 + 2x_2 + 2x_3 = 2$$
$$-3x_1 + 4x_2 + x_3 = 1$$

Using the matrix inverse method.

5. a) Determine the real roots of **7**

$$f(x) = (0.8 - 0.3x)/x$$

Using three iterations of false position method and initial guess of 1 & 3.

b) Use Newton - Raphson method to estimate roots of $f(x) = e^{-x} - x$, employ initial guess $x_0 = 0$. 7

OR

6. You are designing spherical tank to hold water. The volume of liquid it can hold can be computed as 14

$$V = \pi h^2 \frac{[3R - h]}{3}$$

where V = Volume (m^3), R = radius (m) h = depth of water in the tank (m) if R = 3 m, to what depth must the tank be filled so that it holds $30\,m^3$? Use any numerical method. You can employ initial guesses of O and R.

SECTION - B

7. The progress of a homogeneous chemical reaction is followed and it is desired to evaluate the rate constant and order of reaction. The rate law expression for reaction is known to follow the power function of form. 14

$$-rA = kC_A^n$$

Use the data provided below to obtain n and k.

$-r_A$ mol/lit. min	10.1	17.1	22.5	29.0	40.1
C_A mol/lit.	1.0	1.3	1.5	1.7	2.0

OR

8. Fit the following data with power model $y = ax^b$, use the resulting power equation to predict y at $x = 13$. 14

x	2.9	3.4	6	8	12	15
y	14	15	9.0	7.9	4.9	4.3

9. a) What is local optima and global optima. 5

b) Explain the Fibonacci search method to solve the optimization problem involving single variables. 8

OR

10. Minimize 13

$$f(x) = x^5 - 5x^3 - 20x - 5$$

by unrestricted search with step size of 0.1, starting from x = 0.

11. a) Write programme in C to solve the quadratic equation. 6

b) Explain the use of algorithm and flow chart in design of programme language. 7

OR

12. a) What is predictable module? Give its properties. 7

b) Explain the subroutine libraries. 6

****