

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- VIIIth SEMESTER–EXAMINATION – MAY- 2012****Subject code: 181406****Date: 08/05/2012****Subject Name: Food Engineering Computations and Numerical Analysis****Time: 10:30 am – 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** What do mean by interpolation? When is single and double interpolation necessary? **07**

Calculate the enthalpy (kJ/kg) of superheated steam at 4 bars and 200°C using the following data from steam table.

Pressure (bar)	Temperature (°C)		
	180	210	240
1	2835.97	2895.24	2954.66
2	2830.39	2890.90	2951.17
5	2812.45	2877.24	2940.31

- (b)** Differentiate between; **07**

1. Figure window and Editor window
2. Work space and Command history
3. M-files and Mat-files

- Q.2 (a)** What are the uses of output formats in MATLAB discuss with examples. **07**
Provide the steps to calculate the following quantities in MATLAB;

$$\frac{2^5}{2^5 - 1} \text{ and } 3 \frac{\sqrt{5} - 1}{(\sqrt{5} + 1)^2} - 1$$

- (b)** What do you understand by curve fitting and interpolation in MATLAB? Give the steps to draw the straight line (linear) fit of the following data; **07**

X	15	25	35	60	100
Y	25	37	67	170	507

OR

- (b)** Discuss the followings; **07**

1. Command windows
2. Data type
3. Basic 2-D plots
4. Basic 3-D plots

- Q.3 (a)** Using Gauss- Jordan method, solve the following system of equations **07**
 $3x + 4y - 7z = 23$
 $7x - y + 2z = -14$
 $x + 10y - 2z = 33$

- (b)** Find the approximate root of $x^3 - 3x + 1 = 0$ by Regula-falsi method. **07**

OR

- Q.3 (a)** Solve the following equations by Jacobi's iteration method **07**
 $5x - y + z = 10$
 $2x + 4y = 12$
 $x + y + 5z = -1$
 Start with the solution (2, 3, 0).

- (b)** With help of suitable example, briefly explain round-off error and truncation error. What do you mean by approximation of error? **07**

- Q.4 (a)** With help of a representative diagram **07**
 (i) Express the Cartesian co-ordinate (2, -5) as polar co-ordinate, correct to 2 decimal places, in both degree and radian.
 (ii) Express the polar co-ordinate (3.6, 2.5 rad) as Cartesian co-ordinate, correct to 3 decimal places.

- (b)** The Power Law model of Non-Newtonian fluid is given by **07**

$$\sigma = K\gamma^n$$

where, σ = shear stress in the fluid (Pa); K = consistency coefficient (Pa.sⁿ); n = flow behaviour index (no units); γ = shear rate (1/s)

What are the constants and variables in this equation? Is this a linear equation in σ ? If not, can you linearize it?

Quark (a soft cheese), a Power law fluid have the following rheological information:

Shear rate (s ⁻¹)	20	40	80	300	500
Shear stress (Pa)	3450	4000	4600	6000	6600

Determine the consistency coefficient and flow behavior index.

OR

- Q.4 (a)** The decay of microorganisms are modeled with a general equation of the form **07**

$$N = N_0 e^{-kt}$$

where, N = final population of microorganisms at time t, no.

N_0 = initial population of microorganism, no.

k = rate constant affecting the rate of decay (s⁻¹)

t = time (s)

Can you write the above equation in linear form?

The Following data were obtained from a thermal resistance experiment conducted on a spore suspension at 112°C:

Time (min)	0	15	30	45	60
No. of Survivors	10^6	2.9×10^5	8.4×10^4	2.4×10^4	6.9×10^3

Calculate the rate constant, k.

- (b) Given the position function, $s = 8t^3 - 4t^2 + 2t - 1$ (m). What is velocity and acceleration at $t = 3s$? **07**

- Q.5** (a) Write the details of the following commands in plot commands which specify colours in MATLAB. **07**

1. y
2. m
3. c
4. r
5. g
6. b
7. w
8. k

- (b) What the different types are of file for storing the data or programme in MATLAB, explain in detail. **07**

OR

- Q.5** (a) Do the programming in worksheet of the following numerical **07**

1. Calculate how many kg/hr of sugar syrup with 10% sugar must be fed to an evaporator to produce 10000kg/hr of sugar syrup with 65% sugar.
2. How much dry sugar must be added in 100kg of aqueous solution in order to increase its concentration from 20% to 50%.

- (b) Write the shortcut commands of the followings in EXCEL; **07**

1. Display data menu
2. Display tool menu
3. Hide row
4. Insert function
5. Replace
6. Apply exponential format
7. Apply percent style
