Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII • EXAMINATION – SUMMER • 2015

Subject code: 181406 **Date:05/05/2015**
Subject Name: Food Engineering Computation and Numerical Analysis
Time: 10.30AM-01.00PM **Total Marks:** 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use log-log and semi-log paper wherever necessary.**

Q.1 **(a)** Write the details of the following commands in plot commands which specify colours in MATLAB. **07**

Y, m, c, r, g, b, w, k

(b) Explain the interpolation and also describe the single and double interpolation of data? **07**

Calculate the specific volume (m^3/kg) of superheated steam at 0.06 MPa and 638°C using the following data from steam table.

Pressure (MPa)	Temperature (^{o}C)	
	600	650
0.01	42.396	44.603
0.05	9.0876	9.371

Q.2 **(a)** What is velocity and acceleration at y = 3s?Given the position function, s = $9y^3 – 4y^2 + 2y – 1$ (m). **07**

(b) Fresh orange juice containing 9% solid is concentrated in an evaporator to 60% solids. If the juice is entering at 800kg/hr. Develop a worksheet to calculate the amount of water removed and concentrated juice is produced. Also draw the flow diagram of the above process **07**

OR

(b) Determine the approximate positive root of the quadratic equation $5x^2 + 11x – 17 = 0$ correct to 2 significant figures by using Newton-Raphson method. **07**

Q.3 **(a)** What are the constants and variables in this equation? Is this a linear equation in σ? If not, can you linearize it? **07**

The Power Law model of Non-Newtonian fluid is given by

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

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

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

Shear rate (s^{-1})	30	50	150	400	500
Shear stress (Pa)	3648	4900	5600	6750	7000

Determine the consistency coefficient andflow behavior index.

(b) One face of stainless steel plate thickness is maintained at 110^0C, while the other face is at 90^0C. Assuming steady state condition, calculate the rate of heat transfer per unit area through the plate, by developing a worksheet. Thermal conductivity of stainless steel is 17W/m^0C. **07**

OR

Q.3 **(a)** With help of a diagram, Express the Cartesian co-ordinate (4, –8) as polar co-ordinate, correct to 2 decimal places, in both degree and radian and also Express the polar co-ordinate (5.6, 4.5 rad) as Cartesian co-ordinate, correct to 3 decimal places **07**

(b) Give the sequence wise steps to calculate the following quantities in MATLAB; **07**

$$\frac{5^5}{5^5-1} \text{ and } 3\frac{\sqrt{7}-1}{(\sqrt{7}+1)^2}-1$$

Q.4 **(a)** What is Kirchhoff's law and what is its significant. A loaf of bread passing through a baking oven, the walls of which are maintained at a constant temperature of 220^0C. The bread has an area of 0.09 m^2 and is at 100^0C. The emmisivity of bread may be taken as 0.52. In addition to the radiation heat , there is convective heat also by air at 220^0C. Calculate the heat transfer rate, by developing a worksheet. **07**

(b) What are the importance of food engineering computation and numerical analysis **07**

OR

Q.4 **(a)** Solve the system of equations using Gauss-elimination method. **07**

$$x + 4y + 5z = 10$$
$$x + 5y - 4z = 7$$
$$4x - y + z = 5$$

When Gauss-elimination method fails?

(b) The following table gives the data to draw a linear fit. Give the steps to draw the straight line (linear) fit of the following data; **07**

X	5	10	20	50	100
Y	15	33	53	140	301

Q.5 **(a)** Explain Command windows, Command history, Data type and Mat-files **07**

(b) With help of a representative diagram **07**

(i) Express the Cartesian co-ordinate (4, –3) as polar co-ordinate, correct to 2 decimal places, in both degree and radian.

Express the polar co-ordinate (2.83, $\frac{3\pi}{4}$ rad) as Cartesian co-ordinate, correct to 3 decimal places.

OR

Q.5 **(a)** Write the shortcut commands of the followings in EXCEL **07**

Display data menu, Display tool menu, Hide row, Insert function, Replace, Apply exponential format, Apply percent style

(b) Explain Artificial Neural Network (ANN) and list out its application in the area of food processingtechnology. **07**

****