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SIXTH SEMESTER
MID SEMESTER EXAMINATION

Roll No.....
B.TECH
March-2019

**PT312 Numerical Methods in Chemical Engineering**

**Time: 1 Hour 30 minutes**

**Max. Marks - 25**

**Instructions to the candidates:**

1) Attempt All questions
2) All questions carry equal marks
3) Questions should be solved by using numerical methods asked in that particular question.
4) Marks will be awarded for step by step correct solutions.
5) Zero marks will be awarded for direct solutions or solution by using other methods.

Q.1 (a) Round of the following numbers up to 4 significant digits.

(i) 0.000752415

(ii)0.0008500

(b) Solve the following system of linear equations, by Gauss-Elimination method.

$$x_1 + 2x_2 + 3x_3 = 10$$

$$x_1 + 3x_2 - 2x_3 = 7$$

$$2x_1 - x_2 + x_3 = 5$$

Q.2 Compute the solution of the system of linear equations by Gauss-Seidal iteration method.

$$6.7x_1 + 1.1x_2 + 2.2x_3 = 20.5$$

$$3.1x_1 + 9.4x_2 - 1.5x_3 = 22.9$$

$$2.1x_1 - 1.5x_2 + 8.4x_3 = 28.8$$

Solve problem up to four iterations. Take $x_1 = 1$, $x_2 = 2$ and $x_3 = 3$ as initial gauss

Q.3 Compute a root of $x \ln x = 1$ by Regula-Falsi Method, correct to three decimal places. Where x lies between 1 and 2.

P.T.O

Q.4 Specific gravity of a newly developed material is measured at different temperatures as below

| Temperature (°C) | Specific gravity |
|---|---|
| 30 | 3.56 |
| 35 | 3.28 |
| 40 | 3.04 |
| 45 | 2.90 |
| 50 | 2.74 |
| 55 | 2.52 |
| 60 | 2.28 |

Determine the values of specific gravity at 33 °C and 58 °C by using Newton's forward interpolation and Newton's backward interpolation, respectively.

Q. 5 Viscosity of a Non-Newtonian fluid is measured at different shear-rate as shown below

| Shear rate ($\dot{\gamma}$) ($s^{-1}$) | Viscosity ($\eta$) (Pa.s) |
|---|---|
| 100 | 250 |
| 500 | 210 |
| 1000 | 158 |
| 5000 | 112 |
| 10000 | 40 |
| 50000 | 08 |

Following equation (Power law) may be applied to correlate the shear rate to the viscosity

$$\eta = m(\dot{\gamma})^{n-1}$$

Where $m$ and $n$ are the constant. Fit the experimental data in the equation by using least square recreation and calculate the values of the constants.

**END**