B.E. Instrumentation Engineering Eighth Semester

IN802 - Process Modelling and Optimization

P. Pages : 2 **GUG/W/18/2061**

Time : Three Hours * 1 5 7 7 * Max. Marks : 80

Notes : 1. Same Answer book must be used for each question.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. All questions carry marks as indicated.
5. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Discuss in details why model is needed? Write a short notes on: **8**
i) White Box model. ii) Black Box model

b) Derive the mathematical model of constant hold up CSTR. **8**

OR

2. a) Illustrate principles of formulation of mathematical model along with suitable application. **8**

b) Obtain a transfer model of any mechanical system. **8**

3. a) Solve using Euler's modified method to find an appropriate value of y corresponding to x = 0.1, given that, $\frac{dy}{dx} = x^2 + y$ with $y(0) = 1$, and $h = 0.05$. **8**

b) Solve $x^3 - 2x - 5 = 0$, use newton Raphson method to find a root of the equation. **8**

OR

4. a) Given $\frac{dy}{dx} = 1 + y^2$, Where $y = 0$, when $x = 0$, find y (0.2), y (0.4) and y (0.6) and h = 0.2 apply Runge-Kutta Fourth order method. **8**

b) Solve using Euler's method to find an approximate value of y, given that, **8**
$\frac{dy}{dx} = -y$ with the condition $y(0) = 1$, and h = 0.01.

5. Develop Modeling of heat Exchanger. **16**

OR

6. Develop model of Distillation column. **16**

7. a) Discuss unimodal and multimodal in brief. **8**

b) Illustrate the concept of scanning and bracketing procedure. **8**

OR

8. a) Apply Newton's method to find the real root of the equation $xe^x - 2 = 0$. correct to three decimal places. **8**

b) Discuss Quasi newton method. **8**

9. a) What is Karmarkar algorithm? Discuss in details. **8**

b) Find the maximum value of $z = 2x + 3y$, subject to the constraints $x + 2y \leq 4$, $3x + y \leq 6$, and $x, y \geq 0$ apply graphical method. **8**

OR

10. a) Illustrate graphical method in details. **8**

b) Find the solution of the following problem apply Karmarkar's method. **8**

i) Minimize $3x_1 + 4x_2$,

subjected to, $4x_1 + x_2 - 2x_3 = 3$

$5x_1 - 2x_2 = 3$

$x_i \geq 0, i = 1, 2, 3.$

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