QPC: RN18001226 AR - 18 Reg. No.

GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

B. Tech Degree Examinations, November – 2021

(Seventh Semester)

BCHPE7030 – Process Modelling and Simulation

(Chemical Engineering)

Time: 3 hrs Maximum: 100 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) (2 x 10 = 20 Marks)

Q.1. Answer ***ALL*** questions		[CO#]	[PO#]
a.	Which of the following is a way of imitating a change or event in the world to predict what will happen and why? (i) Model (ii) simulation (iii) Law (iv) Science	CO1	PO1
b.	Concentration gradient is the driving force of _____ (i) Heat transfer (ii) Mass transfer (iii) Fluid mechanics (iv) None	CO1	PO1
c.	Temperature gradient is the driving force of _____ (i) Heat transfer (ii) Mass transfer (iii) Fluid mechanics (iv) None	CO1	PO1
d.	For isothermal batch reactor, the value of inlet mass flow rate is (i) 1 (ii) 0 (iii) 20 (iv) 2	CO2	PO1
e.	For flash drum, how many outlets are there? (i) 2 (ii) 1 (ii) 3 (iv) 4	CO2	PO1
f.	What is constraint? (i) Response (ii) Parameter (iii) Principle (iv) Limitation	CO3	PO1
g.	The value of golden ratio is _____ (i)1 (iii) 1.5 (iii) 1.618 (iv) 0.618	CO3	PO1
h.	What is the product enthalpy of a process simulator if the feed is 15J, heat input is 10J and work performed is 5J? (i) 10J (ii) 15J (iii) 20J (iv) 30J	CO1	PO2
i.	Which of the following is a feature of process simulator? (i) Equipment sizing functions (ii) Import and export data (iii) Scheduling of batch operations (iv) All of these	CO4	PO1
j.	_____ is considered to be a numerical computation used in conjunction with dynamic mathematical models. (i) Analysis (ii) Dynamic computation (iii) System simulation (iv) None	CO4	PO1

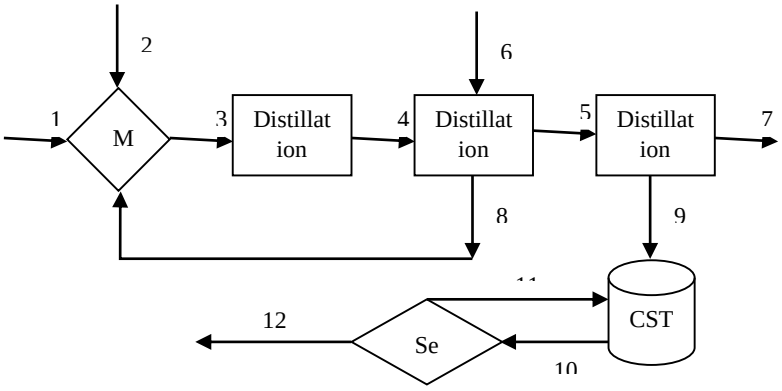
PART – B: (Short Answer Questions) (2 x 10 = 20 Marks)

Q.2. Answer ***ALL*** questions		[CO#]	[PO#]
a.	Differentiate between physical and mathematical model.	CO1	PO1
b.	Define lumped model?	CO1	PO1
c.	What is activity co-efficient?	CO1	PO1
d.	Write the limitation for Fibonacci search method.	CO3	PO1
e.	What is slack variable?	CO3	PO1

f.	Define global optima with neat sketch.	CO3	PO1
g.	Define constant hold up.	CO2	PO1
h.	Define modularity.	CO4	PO1
i.	What is law of mass action?	CO1	PO1
j.	Name different process simulators for simulation.	CO4	PO1

PART – C: (Long Answer Questions) (15 x 4 = 60 Marks)

Answer ***ALL*** questions		Marks	[CO#]	[PO#]
3. a.	Explain the design equation for a perfectly mixed batch reactor (no inflow & outflow) with first-order isothermal consecutive, simultaneous & reversible reactions.	10	CO1	PO1
b.	Explain the mathematical model for energy equation.	5	CO1	PO1
	(OR)			
c.	Explain the design equation of a Plug flow reactor with neat sketch.	10	CO1	PO1
d.	Write the different steps for the formulation of a model.	5	CO1	PO1
4. a.	Develop the mathematical model of ideal binary distillation column	10	CO2	PO3
b.	Derive the mathematical model for constant hold up multi stage CSTR in isothermal condition.	5	CO2	PO3
	(OR)			
c.	Develop the mathematical model of a double pipe heat exchanger where the resistance to heat transfer from a condensing fluid to inner fluid can be represented by convective heat transfer co-efficient on both sides of the heat transfer wall. Assume that resistance of wall is negligible but the wall has finite heat capacity.	10	CO2	PO3
d.	Explain the design equation of a single component vaporizer with neat sketch.	5	CO2	PO3
5. a.	Find the root of the equation sinx–coshx+1=0, correct to 4 decimal places, using Regula falsi method. The root lies between 1 & 2.	10	CO3	PO2
b.	Explain dichotomous method.	5	CO3	PO1
	(OR)			
c.	Solve the following LPP using simplex method. Max Z=X1+X2+3X3 Subject to, 3X1+2X2+X3≤3 2X1+X2+2X3≤2 X1, X2, X3≥0	10	CO3	PO2
d.	Explain Wegstein's method.	5	CO3	PO1
6. a.	Encode the following information flow diagram with the following matrices	10	CO4	PO2



Process matrix, Stream connection matrix, Incidence matrix and Adjacency matrix

b.	Explain different types of simulation.	5	CO4	PO1
	(OR)			
c.	Explain in details about dynamic simulation.	10	CO4	PO1
d.	Write in details about process simulator.	5	CO4	PO1

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