Program: BE Chemical Engineering

Curriculum Scheme: Revised 2012

Examination: Final Year Semester VIII

Course Code: CHC801

Course Name: Modelling, Simulation & Optimization

Time: 1 hour Max. Marks: 50

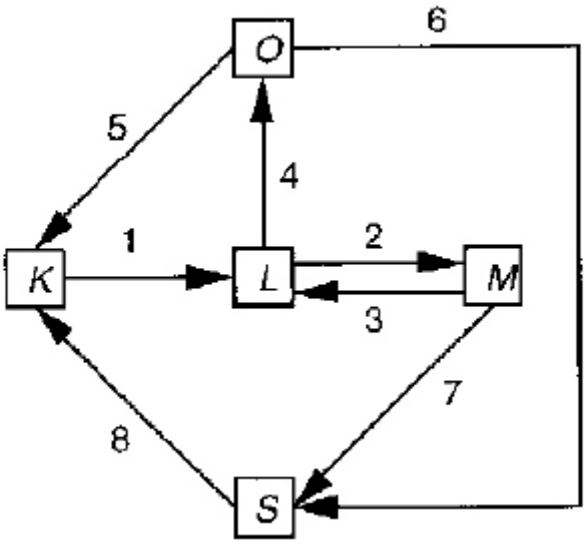
Note to the students:- All Questions are compulsory and carry equal marks .

Q1.	Mathematical models are based on ------
Option A:	Analogy between such systems are mechanical and electrical
Option B:	Mathematical equations to represent the system
Option C:	Analysis
Option D:	Numerical methods
Ans:	
Q2.	Parameter estimation on model development using regression is based on?
Option A:	Maximisation of difference between model predictions and data
Option B:	Model predictions are varying exponential as data calculated
Option C:	Minimisation of difference between model predictions and data
Option D:	Model predictions are square of the data
Ans:	
Q3.	Kremser equation? if A_E is absorption factor, l is liquid flowrate and v vapour flowrate and r is recovery?

Option A:	$$N=\frac{\ln\left(\frac{l_0^n+(r-A_E)v_{N+1}^n}{l_0^n-A_E(1-r)v_{N+1}^n}\right)}{\ln(A_E)}$$
Option B:	$$N=\frac{\ln\left(\frac{v_0^n+(r-A_E)l_{N+1}^n}{l_0^n-A_E(1-r)v_{N+1}^n}\right)}{\ln(A_E)}$$
Option C:	$$N=\frac{\ln\left(\frac{l_0^n+(r-A_E)v_{N+1}^n}{v_0^n-A_E(1-r)l_{N+1}^n}\right)}{\ln(A_E)}$$
Option D:	$$N=\frac{\ln\left(\frac{l_0^n+(r-A_E)v_{N+1}^n}{l_0^n-A_E(1-r)v_{N+1}^n}\right)}{\ln(A_E)}$$
Ans:	
Q4.	The equation of material balance, (Final condition + Sum of outputs) is equal to which of the following?
Option A:	Initial condition + Sum of inputs
Option B:	Initial condition – Sum of inputs
Option C:	Sum of inputs – Initial condition
Option D:	Sum of inputs – Initial condition
Ans:	
Q5.	**Which of the following is a transport law equation?**
Option A:	Gibbs-Duhem equation
Option B:	Equation of Fourier's law of heat conduction
Option C:	Arrhenius equation

Option D:	van Laar equation
Ans:	
Q6.	Stationary point is a point where, function f(x,y) have?
Option A:	$\partial f/\partial x = 0$
Option B:	$\partial f/\partial y = 0$
Option C:	$\partial f/\partial x = 0$ & $\partial f/\partial y = 0$
Option D:	$\partial f/\partial x < 0$ and $\partial f/\partial y > 0$
Ans:	
Q7.	Which of them is an equilibrium equation where μ is chemical potential α, β are phase, K is constant i is the species x is liquid composition and y is vapour composition?
Option A:	$\mu_i^{\alpha} = \mu_i^{\beta}$
Option B:	$K_i = \frac{x_i}{y_i}$
Option C:	$K_i = \frac{y_i}{\mu_i}$
Option D:	$\mu_{\alpha}^{i} = \mu_{\beta}^{i}$
Ans:	
Q8.	The Rachford Rice Equation is derive using
Option A:	$\sum_{i=1}^{n} y_i - \sum_{i=1}^{n} x_i = 0$
Option B:	$\sum_{i=1}^{n} y_i - \sum_{i=1}^{n} x_i = 1$

Option C:	$$\sum_{i=1}^{n} y_i - \sum_{i=1}^{n} x_i = \frac{\sum_{i=1}^{n}(z_i - 1)}{1 + \frac{V}{F}(K_i - 1)}$$
Option D:	$$0 = \frac{\sum_{i=1}^{n}(z_i - 1)}{1 + \frac{V}{F}(K_i - 1)}$$
Ans:	
Q9.	What is the work done for an ideal gas isothermal process?
Option A:	Zero
Option B:	Equal to heat transferred
Option C:	Equal to change in internal energy
Option D:	Constant
Ans:	
Q10.	The material balances to be considered in determination of degrees of freedom for systems in which chemical reactions occur are :
Option A:	Compound balances
Option B:	Elemental balances
Option C:	Mixture balances
Option D:	Alloy balances
Ans:	
Q11.	If Degrees of freedom of a system is negative means
Option A:	Over specified System
Option B:	Eigen values are positive
Option C:	Underspecified

Option D:	Solution is feasible
Ans:	
Q12.	The Tearing Stream for the flowsheet mentioned is 
Option A:	Stream 1 & 5
Option B:	Stream 5 & 8
Option C:	Stream 1 & 3
Option D:	Stream 8 &3
Ans:	
Q13.	In Modular Mode Approach while solving a flowsheet
Option A:	Entire Flowsheet is Solved
Option B:	The Units are Encapsulated.
Option C:	Flowsheet topology and unit equations are combined
Option D:	Stream Tearing is not used.
Ans:	

Q14.	Input mass in a process simulator is 2 Kg and output mass is _______ Kg.
Option A:	1
Option B:	2
Option C:	3
Option D:	4
Ans:	
Q15.	Equation oriented approach need,
Option A:	Moderate computing power
Option B:	Fast and powerful computer
Option C:	Low computing power
Option D:	No computing power
Ans:	
Q16.	In Equation-Oriented approach of simulation, ____________ for the set of unknown variables is very important.
Option A:	Initialization
Option B:	Normalization
Option C:	Mimimization
Option D:	Maximization
Ans:	
Q17.	Precedence ordering is used to partition the set of equations into a sequence of smaller sets of __________ equations.
Option A:	Reducible
Option B:	Redundant

Option C:	Irrelevant
Option D:	Irreducible
Ans:	
Q18.	In_______ simulation unit and thermo dynamic model remain self contained.
Option A:	Modular mode simulation
Option B:	Steady state simulation
Option C:	Equation oriented mode simulation
Option D:	Dynamic state simulation
Ans:	
Q19.	The process optimization chain is as follows:
Option A:	Measuring-Controlling-Optimizing.
Option B:	Controlling-Measuring- Optimizing
Option C:	Controlling - Optimizing-Measuring
Option D:	Measuring- Optimizing- Controlling
Ans:	
Q20.	Local Maxima can be located if which condition is satisfied?
Option A:	$\frac{\partial f}{\partial x} \leq 0; \frac{\partial^2 x}{\partial f^2} \geq 0$
Option B:	$\frac{\partial f}{\partial x} \geq 0; \frac{\partial^2 f}{\partial x^2} \leq 0$

Option C:	$$\frac{\partial f}{\partial x} \leq 0; \frac{\partial^2 f}{\partial x^2} \leq 0$$
Option D:	$$\frac{\partial f}{\partial x} \geqslant 0; \frac{\partial^2 f}{\partial x^2} = 0$$
Ans:	
Q21.	A rectangular box with a square base and no top has a volume of 500 cubic inches. Find the length of the edge of the square base and height for the box that requires the least amount of material to build. Conduct two iterations using an initial guess of l = 5 in .
Option A:	Base edge length is 10.00 and height is 5.00
Option B:	Base edge length is 9.17 and height is 6.00
Option C:	Base edge length is 9.00 and height is 6.17
Option D:	Base edge length is 10.00 and height is 10.00
Ans:	
Q22.	Which of the following statements is INCORRECT?
Option A:	If the second derivative at x_i is negative, then x_i is a maximum.
Option B:	If the first derivative at x_i is zero, then x_i is an optimum.
Option C:	f x_i is a minimum, then the second derivative at x_i is positive
Option D:	The value of the function can be positive or negative as any optima.
Ans:	
Q23.	Find the root of equation using direct substitution method f(x) = $e^{-x} - x$. Till two iterations taking x0 = 0

Option A:	0
Option B:	1
Option C:	0.367879
Option D:	0.564879
Ans:	
Q24.	Newton's method is used to solve
Option A:	Systems of non-linear equations
Option B:	partial differential equations
Option C:	Ordinary differential equations
Option D:	Simultaneous algebraic equations
Ans:	
Q25.	Consider the points closest to the origin on the planes x + y + z = a.
Option A:	The closest point travels farther as **a** is increased
Option B:	The closest point travels nearer as **a** is increased
Option C:	The closest point is independent of **a** as **a** is not there in the expression of the gradient.
Option D:	Varies as $\mathbf{a}^2$, away from the origin.
Ans:	