

Sample Questions

Chemical Engineering

Subject Name: Modelling, Simulation, Optimization

Semester: VIII

Multiple Choice Questions

Choose the correct option for following questions. All the Questions carry equal marks.	
1.	Which of the following methods is most widely used to solve the non-linear equations
Option A:	Guass Jordon Method
Option B:	Newton Raphson method
Option C:	Guass Elimination Method
Option D:	Adam's bashforth Method
2.	The order in which the groups of flowsheet are solved are is called as
Option A:	Partitioning
Option B:	Tearing
Option C:	Precedence ordering
Option D:	Recycling
3.	The partitioning of flowsheet is _____
Option A:	Unique
Option B:	Imitable
Option C:	Random
Option D:	Structured
4.	In tearing we assign the parameters for torn stream tearing is the _____ process
Option A:	Optimization
Option B:	Trial and error
Option C:	Complicated
Option D:	Time consuming
5.	A model equation is called as non-linear equation if
Option A:	If its graph is in the form of curve
Option B:	Its graph is of straight line
Option C:	It involves linear terms
Option D:	If it does not contain any exponential term

6.	Which method for solving nonlinear algebraic equations requires calculation of derivatives?
Option A:	Direct substitution method
Option B:	Secant method
Option C:	Bisection method
Option D:	Newton's method
7.	Powell dogleg method involves steps which follow a combination of the steepest descent and Newton steps which is :
Option A:	Logarithmic
Option B:	Non-linear
Option C:	Linear
Option D:	Exponential
8.	Which of the following is not applicable to direct substitution method?
Option A:	It can be used to solve nonlinear algebraic equations
Option B:	It requires calculation of derivatives
Option C:	It does not require calculation of derivatives
Option D:	It has a slow rate of convergence
9.	Armijo line search adds the following to Newton's method, particularly if the starting point is poor :
Option A:	Reliability and Robustness
Option B:	Uncertainty
Option C:	Randomness
Option D:	Uncertainty
10.	Dominant Eigenvalue method is used for :
Option A:	Numerical integration
Option B:	Solution of ordinary differential equations
Option C:	Solution of partial differential equations
Option D:	Solution of nonlinear algebraic equations
11.	Which type of variable can take only distinct values in an interval?
Option A:	Discrete
Option B:	Independent
Option C:	Dependent
Option D:	Continuous
12.	There is no inflow and outflow term in the total continuity equation of a :
Option A:	Batch reactor
Option B:	CSTR

Option C:	PFR
Option D:	Semi-batch reactor
13.	For a mathematical model consisting of five equations to be solved there should be five :
Option A:	Parameters
Option B:	Forcing functions
Option C:	Independent variables
Option D:	Dependent variables
14.	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
15.	In _____ problem of heat exchanger, size and configuration is known but heat duty is unknown :
Option A:	Design
Option B:	Synthesis
Option C:	Rating
Option D:	Construction
16.	Constant holdup in a CSTR implies constant _____ .
Option A:	Pressure
Option B:	Temperature
Option C:	Volume
Option D:	Concentration
17.	In stream tearing if row k dominates row l then :
Option A:	Add row l
Option B:	Add row k
Option C:	Delete row l
Option D:	Delete row k
18.	Precedence ordering is used to partition the set of equations into a sequence of smaller sets of _____ equations.
Option A:	Reducible
Option B:	Redundant

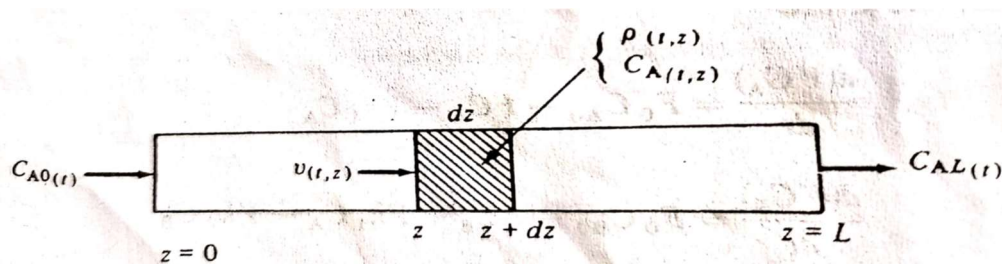
Option C:	Irrelevant
Option D:	Irreducible
19.	In Sequential Modular approach of simulation, _____ is required because of loops of information created by recycle streams.
Option A:	Partitioning
Option B:	precedence ordering
Option C:	Tearing
Option D:	Mixing
20.	The steepest descent method has a _____ rate of convergence :
Option A:	Linear
Option B:	Quadratic
Option C:	Cubic
Option D:	Logarithmic

Descriptive Questions

Three CSTR are connected in series of reaction $A \rightarrow B$ is taking place in each reactor. Each reactor is maintained at different temperature and rate constant in each reactor is k_1, k_2 and k_3 . Volume of reactors is V_1, V_2 and V_3 respectively. The reactant A is fed to the first reactor at a volumetric flow rate of F_0 and Concentration C_{A0} . Derive the mathematical model for the system. Also find the degree of freedom and identify the forcing functions.

Assumptions: perfectly mixed tanks, constant hold up, constant density and isothermal condition in each tank.

Write the component continuity equation for a tubular reactor with reaction (isothermal, first order) $A \xrightarrow{k} B$.



Explain in detail optimization and types of optimization.

Solve graphically the following problem:

$$\text{Maximize } Z = 2x_1 + 3x_2$$

$$\text{subject to } x_1^2 + x_2^2 \leq 20,$$

$$x_1x_2 \leq 8 \text{ and } x_1, x_2 \geq 0$$

An irreversible, exothermic reaction $A \xrightarrow{k} B$, is carried out in a single perfectly mixed CSTR as shown in figure. The reaction is nth order in reactant A and has a heat of reaction λ (cal/gmol of A reacted). Negligible heat losses and constant densities are assumed. A perfectly mixed cooling jacket is provided to remove the heat. Thermal inertia of the metal wall can be neglected. Derive the mathematical model for the system.

Write the component continuity equations describing the CSTR with

- Simultaneous reactions (first order, isothermal): $A \xrightarrow{k_1} B, A \xrightarrow{k_2} C$
- Reversible (first order, isothermal) : $A \rightleftharpoons B$ with k_1 and k_2 are forward and backward reaction rate constants

Explain in detail Williamsottoflowheet.

Explain types of simulation.

$$\text{Max. } Z = 10x_1 + 4x_2 - 2x_1^2 - 3x_2^2,$$

subject to

$$2x_1 + x_2 \leq 5$$

$$x_1, x_2 \geq 0$$

Explain types of simulation

Explain optimization of Distillation column

Write component balance and overall mass balance equation of CSTR

Explain discrete model

Explain mathematical model of Distillation column

Explain in detail types of optimization

Explain the principles of formulation of mathematical models. Explain the classification of mathematical models.

Explain mathematical model for series of three isothermal CSTRs with variable holdups in which first-order reaction occurs.

Determine degrees of freedom for: (i) Stream splitter, (ii) Mixer, (iii) Heat Exchanger, and (iv) Pump.

Differentiate between sequential modular and equation oriented approach of simulation. Explain what is partitioning, precedence ordering and tearing in flow sheet simulation.

Using Newton's method with an Armijo line search, solve the following system of equations :

$$f_1 = 2x_1^2 + x_2^2 - 6 = 0$$

$$f_2 = x_1 + 2x_2 - 3.5 = 0$$

Explain the various methods used for single variable and multivariable optimization.

Sample Questions

Chemical Engineering

Subject Name: Project Engineering & Entrepreneurship Management

Semester: VIII

Multiple Choice Questions

Choose the correct option for following questions. All the Questions carry equal marks.	
1.	80 to 85% work is done in ----- phase.
Option A:	Concept phase
Option B:	Definition phase
Option C:	Implementation phase
Option D:	Closure phase
2.	Line of balance (LOB) is used to control ----- of a project.
Option A:	Schedule
Option B:	Imbalance
Option C:	Path of project
Option D:	Design
3.	Project management is fully bound by time, cost ,----- and performance targets.
Option A:	Investment
Option B:	Expenditure
Option C:	Quality
Option D:	Location
4.	Which is NOT type of feasibility report ?
Option A:	Pre feasibility report
Option B:	Techno economic feasibility report
Option C:	Detailed project report
Option D:	Post feasibility report
5.	If NPV is positive,the proposal is -----which means the investment is ----- ---
Option A:	Loss making ,not recoverable
Option B:	Viable,recoverable
Option C:	bad,lost
Option D:	Viable,not recoverable

6.	Electricity clearance is given by
Option A:	State govt
Option B:	Central govt
Option C:	Local authorities
Option D:	State or central govt
7.	Scope is the summation of all ----- required as part of the project
Option A:	Work packages
Option B:	Deliverables
Option C:	Contracts
Option D:	Design data
8.	Better technological control is possible in
Option A:	Matrix organization
Option B:	Task force organization
Option C:	Projectised organization
Option D:	Traditional/functional organization
9.	PERT is a probabilistic model while CPM is ----- model.
Option A:	Deterministic
Option B:	Logical
Option C:	Theoretical
Option D:	Uncertain
10.	Risk increases with hazard but decreases with -----
Option A:	Control
Option B:	Experience
Option C:	Safeguard
Option D:	Money supply
11.	Project Overruns means _____
Option A:	When project completes before time and below expected costs
Option B:	When project location is overrun by aliens
Option C:	When project gets undue publicity
Option D:	When a project exceeds its cost-time targets
12.	In _____ project phase, the project schedule is developed?
Option A:	Conceptual
Option B:	Implementation
Option C:	Planning
Option D:	Design
13.	Detailed project report must not include _____ .

Option A:	publicity brochure
Option B:	detailed design data
Option C:	complete market survey
Option D:	detailed cost estimate
14.	Information regarding all of the following is related to feasibility reports, except:
Option A:	Location
Option B:	Detailed Engineering
Option C:	Raw materials
Option D:	Salary Increment
15.	Forest clearance is first given by _____ then _____ and then by Central govt.
Option A:	local authority, State govt.
Option B:	State govt., Central govt.
Option C:	Only parliament can give forest clearance
Option D:	UN
16.	Which of the following is an advantage of a functional (i.e. classical or traditional) project management organization?
Option A:	Shorter project duration
Option B:	Good integration across functional units
Option C:	Maximum flexibility in the use of staff
Option D:	Strong motivation of project team members
17.	_____ involves determining the information and communications needs of the stakeholders.
Option A:	Performance reporting
Option B:	Managing stakeholders
Option C:	Communications planning
Option D:	Information distribution
18.	PERT analysis is in nature.
Option A:	Optimistic
Option B:	Pessimistic
Option C:	Most likely
Option D:	Probabilistic
19.	A horizontal bar chart that shows project tasks against a calendar is called
Option A:	PERT Chart
Option B:	CPM Chart
Option C:	GANTT Chart
Option D:	Milestone Chart

20.	The earliest start time rule _____
Option A:	compares the activity's starting time for an activity successor.
Option B:	regulates when a project must begin.
Option C:	directs when a project can start.
Option D:	compares the activity's end time for an activity predecessor.

Descriptive Questions

How project management is different than functional/traditional/process management? Elaborate.
Discuss various laws which used to regulate chemical industries.
Discuss task force organization with advantages and disadvantages.
Explain Line of Balance method in detail.
Discuss in detail about Economic Order of Quantity.
Explain 3R of contracting.
Explain CAT vs RAT scheduling techniques.
Discuss methods to estimate project profitability.
Explain in detail procedure to obtain Industrial license.
Explain project phases with the help of Project Life Cycle Curve.
Prepare feasibility report for any chemical industry with suitable example.
Describe various forms of organization.
Explain 7 C's of team building.
Differentiate between PERT and CPM
Explain WBS in detail.
Explain ABC Analysis in detail.
Explain time and cost control tools and explain its techniques
Describe the characteristics of an entrepreneur.

Sample Questions

Chemical Engineering

Subject Name: Energy System Design

Semester: VIII

Multiple Choice Questions

Choose the correct option for following questions. All the Questions carry equal marks	
1.	The Boiling point elevation as the evaporation in an evaporator proceeds can be approximately measured by -----
Option A:	Duhring's rule
Option B:	Arrhenius rule
Option C:	Kozeny Carman rule
Option D:	Siedertate rule
2.	Which of the following is not fundamental element of cogeneration plant?
Option A:	Prime mover
Option B:	Electricity generator
Option C:	Heat recovery system
Option D:	Power factor improvement system
3.	Recuperator will be more efficient if the flow path of hot and cold fluids is in:
Option A:	Co-current mode
Option B:	Counter current mode
Option C:	Cross current mode
Option D:	Parallel mode
4.	Which type of evaporator use the pumps for its operation?
Option A:	Forward feed multiple effect evaporator
Option B:	Backward feed multiple effect evaporator
Option C:	Parallel feed multiple effect evaporator
Option D:	Mixed feed multiple effect evaporator
5.	Provided, if C_C and C_H are heat capacity flow rates of cold and hot process streams respectively, then in pinch decomposition diagram, for a match of hot and cold process streams to be feasible at the pinch, which is the necessary and sufficient condition for stream matching above the pinch?
Option A:	$C_c \geq C_H$
Option B:	$C_c \leq C_H$
Option C:	$C_c = C_H$
Option D:	$C_c < C_H$

6.	While using temperature interval method during pinch analysis cascade diagram is drawn; w.r.t. cascade diagram, the pinch temperature is defined as -----
Option A:	The temperature at which no heat transfer occurs from lower to upper temperature interval
Option B:	The temperature at which no heat transfer occurs from upper to lower temperature interval
Option C:	The temperature at which maximum heat transfer occurs from upper to lower temperature interval
Option D:	The temperature at which minimum heat transfer occurs from upper to lower temperature interval
7.	Find the odd retrofit technique from the following:
Option A:	Occupancysensors
Option B:	Timer basedcontrol
Option C:	Photoelectric sensors
Option D:	Capacitor basedcontrol
8.	Define simple payback period in connection with implementation of any energy conservation opportunity (ECO)
Option A:	Total annual saving after implementing any specific ECO
Option B:	Ratio of extra investment required for implementing ECO to total annual saving expected after implementing that ECO
Option C:	Extra investment required to implement ECO
Option D:	Working period of energy consuming equipment
9.	Which of the following is secondary energy source?
Option A:	Electricity
Option B:	Coal
Option C:	Crude oil
Option D:	Natural gas
10.	Thermal vapor compression, if used in evaporation operation, -----
Option A:	Increases steam consumption
Option B:	Does not affect steam economy
Option C:	Decreases steam economy
Option D:	Increases steam economy
11.	What is the steam economy of an evaporator if the evaporator capacity is 40 kg/hr and the steam consumption is 55kg/hr?
Option A:	0.73
Option B:	0.62
Option C:	0.45
Option D:	1.38
12.	The process return in a co-generation plant is ---
Option A:	Steam
Option B:	Condensate
Option C:	Hot air
Option D:	All of the above

13.	Which of the following has capillary wick structure?
Option A:	Heat pipe
Option B:	Heat wheel
Option C:	Economizer
Option D:	Heat pump
14.	In a multiple effect evaporator, the pressure _____ as we move to subsequent effects.
Option A:	Increases
Option B:	Remain same
Option C:	Decreases
Option D:	Doubles
15.	The design method used for heat exchanger network if feasibility criteria do not match
Option A:	Breaking loop
Option B:	Stream splitting
Option C:	Composite curve
Option D:	Pinch decomposition
16.	The ΔT_{min} below which either heating or cooling utility is required, but not both
Option A:	Threshold approach temperature difference
Option B:	Optimum approach temperature difference
Option C:	Maximum approach temperature
Option D:	LMTD
17.	The process of replacement of boiler water with fresh water is called as
Option A:	Throttle control
Option B:	Blow down
Option C:	On-off control
Option D:	Load –unload control
18.	A 400 watt mercury vapor lamp is highly energy consuming but less energy efficient, hence it is recommended to replace with 325 watt multi vapor lamp. Price of 325 watt lamp is Rs. 500 more than 400 watt lamp. All other costs are same for both the lamps. Calculate simple payback period for this replacement (ECO) if either lamp is to be operated for 4000hrs/ year and electricity costs Rs. 3.75/kWh
Option A:	0.62 years
Option B:	0.35 years
Option C:	0.54 years
Option D:	0.44 years
19.	Energy sources that are either found or stored in nature is known as
Option A:	Commercial energy
Option B:	Non commercial
Option C:	Primary energy
Option D:	Secondary energy
20.	In heat integration of distillation column , an external fluid is required for
Option A:	Multi-effect distillation
Option B:	Heat pump

Option C:	Reboiler flashing
Option D:	Vapor recompression

Descriptive Questions

What are the various techniques to improve lighting efficiency of any facility?																									
Differentiate between Mini and Maxi Energy audit.																									
Write a short note on Heat Wheel.																									
Explain combined cycle cogeneration system with suitable example.																									
Explain how multiple effect evaporator is energy efficient than single effect evaporator.																									
Explain the Breaking loop method used in heat exchanger networking.																									
How energy efficiency of “compressed air system” can be improved?																									
Explain the concept of heat exchanger networking, its purpose and general thumb rules to be followed during heat exchanger networking																									
In backward feed triple effect evaporator (TEE), the temperature of steam and boiling point temperatures in 1 st , 2 nd and 3 rd effect are 130 °C, 115 °C, 95 °C and 72 °C respectively. The flow rates of steam supplied to the 1 st effect and vapor leaving the 1 st , 2 nd and 3 rd effect are 3480, 3160, 2720 and 2110 kg/hr respectively. The latent heats of vaporization of steam and vapors leaving 1 st , 2 nd and 3 rd effect are 2200, 2250, 2310 and 2380 kJ/kg respectively. The overall heat transfer coefficients for 1 st , 2 nd and 3 rd effect are 2500, 2000 and 1600 W/m ² K respectively. Then calculate the heat transfer area available in all effects of this TEE. Assume that there is no any boiling point rise in any of the effects.																									
What is Distributed Generation (DG) cogeneration system? Explain any one type of DG system in detail.																									
Determine the Minimum Energy Targets (Minimum hot and cold utility requirement) and Pinch Temperature for the streams given in following table. Also design a feasible heat exchanger network to satisfy minimum utility target. $\Delta T_{min} = 10\text{ }^{\circ}\text{C}$.																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Stream No.</th> <th style="text-align: center;">Stream Type</th> <th style="text-align: center;">Source Temp. (°C)</th> <th style="text-align: center;">Target Temp. (°C)</th> <th style="text-align: center;">Heat Capacity Flow rate (KW/°C)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">Hot</td> <td style="text-align: center;">180</td> <td style="text-align: center;">60</td> <td style="text-align: center;">3</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">Hot</td> <td style="text-align: center;">150</td> <td style="text-align: center;">30</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">Cold</td> <td style="text-align: center;">30</td> <td style="text-align: center;">135</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">Cold</td> <td style="text-align: center;">80</td> <td style="text-align: center;">140</td> <td style="text-align: center;">5</td> </tr> </tbody> </table>	Stream No.	Stream Type	Source Temp. (°C)	Target Temp. (°C)	Heat Capacity Flow rate (KW/°C)	1	Hot	180	60	3	2	Hot	150	30	1	3	Cold	30	135	2	4	Cold	80	140	5
Stream No.	Stream Type	Source Temp. (°C)	Target Temp. (°C)	Heat Capacity Flow rate (KW/°C)																					
1	Hot	180	60	3																					
2	Hot	150	30	1																					
3	Cold	30	135	2																					
4	Cold	80	140	5																					
What is waste heat? Discuss how the recovery of waste heat can be advantageous.																									
Reboiler flashing in heat integration of distillation column																									
Energy sub-audit																									
Waste heat boiler																									
Bottoming cycle cogeneration system with the suitable example																									
Duhring’s rule																									
Linhoff’s rule for stream matching at the pinch																									
Explain various techniques to make “steam system” energy efficient.																									
As per Pillar furnace manufacturer, water required for cooling circuit is 12.5 lps and 60 mhead. On analysis of pump characteristics, the mismatch in head is clearly seen. Manufacturers’ performance curve indicates that the ‘hp’ for new pump with reduced head could be 65%. Using the pump with 30 m head, what will																									

substantial energy savings? Given data: Power consumption for 60 m is 13.4 kW. The efficiency of the motor is 90%

A forward feed triple effect evaporator is concentrating a liquid that has no appreciable elevation in boiling point. The temperature of steam to the first effect is 108°C, and the boiling point of the solution in the last effect is 52°C. The overall heat transfer coefficients in W/m²K, for the 1st, 2nd and 3rd effect are 2500, 2000 and 1500 respectively. At what temperatures will the liquid boil in the first and second effects? Further if heat transfer area of 1st, 2nd and 3rd effect are 50, 45 and 40 m² respectively, then calculate the amount of heat transferred (in KW) to each of the effect.

Explain combined Gas-steam power plant with help of thermodynamic cycle.

The heat is being exchanged among process hot and cold streams as shown in table. Calculate Pinch Temperature, Hot & Cold Utility requirement. Also design a feasible heat exchanger network to satisfy minimum utility target. $\Delta T_{\min} = 20 \text{ K}$

Stream	T ^s (K)	T ^t (K)	CP=mC _p (KW/K)
1	140	70	4
2	100	40	6
3	60	80	5
4	30	120	3

Discuss in detail about direct and indirect advantages of waste heat recovery.

Sample Questions

Chemical Engineering

Subject Name: Advanced Process Control

Semester: VIII

Multiple Choice Questions

Choose the correct option for following questions. All the Questions carry equal marks	
1.	In digital control, the following is used for analysis
Option A:	Integral equations
Option B:	Differential equations.
Option C:	Laplace transforms
Option D:	z-transforms.
2.	A multiple input multiple output system has
Option A:	Only one controlled variable
Option B:	Only one manipulated variable
Option C:	More than one controlled and manipulated variables
Option D:	No any controlled variable.
3.	A control system having three controlled and three manipulated variables.
Option A:	Will need 9 transfer functions to completely describe the system.
Option B:	Will need only 3 transfer function to completely describe the transfer function.
Option C:	Will need 7 transfer functions to completely describe the system.
Option D:	Will need 15 transfer functions to completely describe the system.
4.	The following is a measure of process interactions
Option A:	Relative Gain Array.
Option B:	Smith predictor.
Option C:	Routh array.
Option D:	Transfer function.

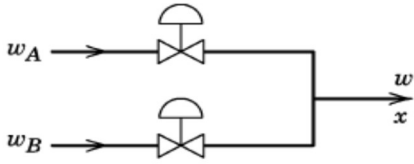
5.	The steady state gain for a system with a transfer function $\frac{12}{2s+7}$ is
Option A:	25
Option B:	12
Option C:	2.5
Option D:	10
6.	In Model Predictive Control
Option A:	There are no constraints on input and output variables.
Option B:	There are constraints on input and output variables.
Option C:	A conventional feedback algorithm is used.
Option D:	A conventional feedforward algorithm is used.
7.	In Model Predictive Control, the number of predictions is called as
Option A:	Control horizon.
Option B:	Prediction horizon.
Option C:	Manipulated horizon.
Option D:	Measurement horizon.
8.	In batch control systems, batch sequencing and logic control occurs at
Option A:	Level 1 and 2
Option B:	Level 2
Option C:	Level 3
Option D:	Level 4
9.	In batch control systems, the sequence of events is maintained by sequential logic is used
Option A:	Sequential logic.
Option B:	PI controller.
Option C:	Smith predictor.
Option D:	Relative Gain Array.
10.	A PI controller

Option A:	Has only one tuning parameter.
Option B:	Has two tuning parameters.
Option C:	Has three tuning parameters.
Option D:	Does not have any tuning parameter.
11.	The best-known strategy to improve the performance of systems containing time delay is
Option A:	Raoult Predictor
Option B:	Smith Predictor
Option C:	Dalton Predictor
Option D:	Simpson Predictor
12.	In cascade control
Option A:	Involves a secondary measurement point and a secondary feedback controller
Option B:	Is a normal feedback control strategy
Option C:	Is a special type of feed forward control strategy
Option D:	Is not an advanced control strategy
13.	The control strategy used to control processes with time delays is
Option A:	Conventional feedback control
Option B:	Conventional feedforward control
Option C:	Cascade control
Option D:	Time delay compensation.
14.	Selective control is same as
Option A:	Feedback control.
Option B:	Feedforward control.
Option C:	Cascade control.
Option D:	Override control.
15.	The control strategy in which controller parameters are adjusted automatically to compensate for changing process conditions is called as
Option A:	Override control.

Option B:	Cascade control.
Option C:	Inferential control.
Option D:	Adaptive control.
16.	The transfer function of a first order with time delay process is
Option A:	$e^{-\theta_D s}$
Option B:	$\frac{K_p e^{-\theta_D s}}{(\tau_p s + 1)}$
Option C:	$\frac{K_p}{(\tau_p s + 1)}$
Option D:	$\frac{(\tau_p s + 1)}{K_p e^{-\theta_D s}}$
17.	In a digital computer, the continuous measurement signals are converted to digital form by
Option A:	Digital to analog convertors
Option B:	Analog to digital convertors.
Option C:	Smith Predictor
Option D:	Relative gain array
18.	In sampling, sampling period Δt is
Option A:	The time required for taking samples.
Option B:	The time for which sampling is done.
Option C:	The time interval between two successive samples.
Option D:	Is a random quantity.
19.	The sampling frequency f_s and the sampling period Δt are related to each other through the following equation
Option A:	$f_s = \frac{1}{\Delta t}$
Option B:	$f_s = \Delta t$
Option C:	$f_s = \Delta t^2$
Option D:	$f_s = \frac{1}{\Delta t^2}$

20.	In process control, filter is used for the following purpose
Option A:	As a final control element.
Option B:	For measuring the controlled variable
Option C:	To remove noise from the process signals
Option D:	For measuring the manipulated variable.

Descriptive Questions

Draw a diagram of control system for Distillation column
How will you remove noise from process Signal
Explain adaptive control strategy
Write down equation for P, PI, PID Controller
Explain Smith Predictor Strategy for control system
Explain Cascade Control System
Derive discrete time model for second order system
An in-line blending system is shown below.

It is proposed that w and x be controlled using a conventional multiloop control scheme, with w_A and w_B as the manipulated variables. Derive an expression for RGA and recommend the best controller pairing for the following conditions $w = 4 \text{ kg/min}$ and $x = 0.4$
Discuss batch control systems
Derive discrete transfer function for PID controller
Consider a first order plus time delay model-
$\frac{Y(s)}{U(s)} = \frac{K e^{-\theta s}}{\tau s + 1}$

Derive an equivalent step response model by consider the analytical solution to a unit step change in the input.

Calculate the step response coefficients for the parameter values of $K = 5$, $\tau = 15$ and $\theta = 3 \text{ min}$

Discuss the procedure for the design of plant wide control systems

Derive transfer function for analog exponential filter.

Write a short note on Adaptive control systems.

Write a short note on Smith Predictor

The following product quality data y_m were obtained from a bioreactor, based on a photometric measurement evaluation of the product

Time (min)	0	1	2	3	4	5	6	7	8
y_m	0	1.5	0.3	1.6	0.4	1.7	1.5	2.0	1.5

Filter the data using an exponential filter with $\Delta t = 1 \text{ min}$ and $\alpha = 0.5$

A process has the following transfer function

$$G(s) = \begin{bmatrix} \frac{-2e^{-s}}{10s+1} & \frac{1.5e^{-s}}{s+1} \\ \frac{1.5e^{-s}}{s+1} & \frac{-2e^{-s}}{10s+1} \end{bmatrix}$$

Use the RGA approach to determine the recommended controller pairing based on steady state considerations

Derive discrete time model for second order system

Discuss batch control systems

Write a short note on Minimum Variance Control

A 2×2 process has the following steady state gain matrix

$$K = \begin{bmatrix} 1 & 0 \\ 10 & 1 \end{bmatrix}$$

Calculate the Eigen values, singular values and the condition number

Discuss Issues in Plant wide control

Derive discrete transfer function for PI controller

Write a short note on types of filters

Discuss the procedure for the design of plant wide control systems

Consider a first order plus time delay model-

$$\frac{Y(s)}{U(s)} = \frac{Ke^{-\theta s}}{\tau s + 1}$$

Derive an equivalent step response model by consider the the analytical solution to a unit step change in the input.

A signal is given by $y_m(t) = t + 0.5\sin t(t^2)$ is to be filtered with an exponential digital filter over the interval $0 \leq t \leq 20$. Using two different values of α (0.8 and 0.2) determine the output of the filter for a sampling period of 1 min. Plot the response for both the cases

Sample Questions

Chemical Engineering

Subject Name: Total Quality Management

Semester: VIII

Multiple Choice Questions

Choose the correct option for following questions. All the Questions carry equal marks	
1.	Attribute charts may be used when:
Option A:	Several characteristics can be jointly measured
Option B:	When one particular quality characteristic is of importance
Option C:	Specific information like process mean is required
Option D:	None of the above
2.	Inspection of incoming/outgoing items is an example of _____.
Option A:	Prevention Cost
Option B:	Appraisal Cost
Option C:	Internal Failure Cost
Option D:	External Failure Cost
3.	Four basic characteristics of an optimal process are:
Option A:	Economy, efficiency, control, quality
Option B:	Quality, Improvement, efficiency, productivity
Option C:	Economy, efficiency, productivity, cost
Option D:	Economy, efficiency, productivity, quality
4.	Lots for acceptance sampling should be _____ and _____.
Option A:	Homogeneous, Large
Option B:	Heterogeneous, Small
Option C:	Homogeneous, Small
Option D:	Heterogeneous, Large

5.	X bar charts are uses to control the _____ of a process.
Option A:	Dispersion
Option B:	Central tendency
Option C:	None of the above
Option D:	Both a and b
6.	The probability distribution function corresponding to tossing of a coin will be a:
Option A:	Probability Density function
Option B:	Probability Mass function
Option C:	Probability Measurement function
Option D:	Probability Cumulative Function
7.	A maturity model can be used as a benchmark for comparison and as an aid to understanding
Option A:	TRUE
Option B:	FALSE
Option C:	Depends
Option D:	can't say
8.	Identify the cost not likely to reduce as a result of better quality.
Option A:	Maintenance costs
Option B:	Inspection costs
Option C:	Scrap costs
Option D:	Warranty and service costs
9.	Kaizen is a Japanese term meaning _____
Option A:	continuous improvement
Option B:	Just-in-time (JIT)
Option C:	a fishbone diagram
Option D:	setting standards

10.	The chart used for tracking number non-conforming is:
Option A:	P
Option B:	Np
Option C:	X bar
Option D:	None of the above
11.	TQM stands for _____
Option A:	Total Quality Management
Option B:	Total Quantity Management
Option C:	Total Qualitative Management
Option D:	To question management
12.	elements of quality management system are _____
Option A:	organizational structure
Option B:	Responsibilities
Option C:	Procedures
Option D:	all the three
13.	Based on his 14 Points, Deming is a strong proponent of _____
Option A:	inspection at the end of the production process
Option B:	an increase in numerical quotas to boost productivity
Option C:	looking for the cheapest supplier
Option D:	training and knowledge
14.	According to Deming most of the problems are related to systems and it is the responsibility of the management to improve the systems
Option A:	Correct
Option B:	correct to some extent
Option C:	correct to great extent

Option D:	Taguchi
15.	Which of the following is not a target of Total Quality Management:
Option A:	Customer Satisfaction
Option B:	Reducing manpower
Option C:	Continuous Cost Reduction
Option D:	Continuous Operational Improvement
16.	A _____ diagram shows the location of defects in any unit. This diagram is used in the analyze step of DMAIC.
Option A:	Affinity
Option B:	Relations
Option C:	Defect Concentration
Option D:	Scatter
17.	A major assumption for p chart is that all units produced are _____
Option A:	Independent
Option B:	Dependent
Option C:	None of the above
Option D:	Cannot be determined
18.	Apart from Poisson distribution, another distribution that can be applied to events data is:
Option A:	Normal Distribution
Option B:	Geometric Distribution
Option C:	Lognormal Distribution
Option D:	Continuous Distribution
19.	The dimension of reliability is concerned with:
Option A:	How easy it is to repair the product
Option B:	How long does the product last
Option C:	Will the product do the intended job

Option D:	How often does the product fail
20.	The probability distribution function corresponding to tossing of a coin will be a:
Option A:	Probability Density function
Option B:	Probability Mass function
Option C:	Probability Measurement function
Option D:	Probability Cumulative Function

Descriptive Questions

Write down the objectives of implementing total productive Maintenance? Discuss about the core elements of TPM Program? Compare TQM and TPM?
What are the ISO 9000 standards? List out the global benefits of adopting ISO 9000 quality system?
Discuss the reasons for benchmarking and state the advantages and limitations
i) What are the types of appraisal formats?
ii) What are the basic ways for a continuous process improvement?
i) Mention the use of stratification chart in TQM?
ii) State the primary objectives of six sigma?
Discuss about the various stages in failure mode and effect analysis?
i) What is Total Quality Management.?
ii) What are the measure dimensions of service quality?
What are the advantages of implementing TQM in a manufacturing organization?
Explain the role of senior level management in TQM implementation?

Sample Questions

Chemical Engineering

Subject Name: Advanced Separation Technology

Semester: VIII

Multiple Choice Questions

Choose the correct option for following questions. All the Questions carry equal marks	
1.	Which of the following is not characteristic of chemisorption?
Option A:	It is irreversible
Option B:	It is multilayer phenomenon
Option C:	It is specific
Option D:	Heat of adsorption is about 400kj
2.	What is the commercial use of silica gel?
Option A:	Removal of organic pollutants from aqueous effluents
Option B:	Production of N ₂ from air
Option C:	Drying of air and other gases
Option D:	Separation of molecules based on size and shape
3.	Which of the following is untrue about pressure swing adsorption?
Option A:	While one bed adsorbs, the other bed desorbs
Option B:	Mechanical work is used to increase pressure
Option C:	With valving, the cyclic sequence can be programmed to operate automatically
Option D:	Applicable for only liquids
4.	Which of the following is the Azeotropic mixture?
Option A:	Air-water
Option B:	Acetic acid – water
Option C:	Acetic acid – alcohol
Option D:	Air-alcohol
5.	By adding entrainer or solvent one of the component's _____ gets reduced.
Option A:	Boiling point
Option B:	Bubble point
Option C:	Dew point
Option D:	Freezing point
6.	Froth floatation is the most suitable for treating _____
Option A:	Iron ores
Option B:	Sulphide ores
Option C:	Quartzite
Option D:	Manganese ore
7.	Name of the compound that acts to stabilize air bubbles in froth floatation?

Option A:	Frothers
Option B:	Modifier
Option C:	Activators
Option D:	Depressants
8.	Which technique is also known as colourwriting ?
Option A:	NMR
Option B:	Mass spectroscopy
Option C:	Chromatography
Option D:	Ion exchange
9.	Separation by polymer membrane,
Option A:	Exploits the difference in volatility
Option B:	Exploits the difference in diffusivity
Option C:	Exploits the difference in flowability
Option D:	Exploits the difference in permeability
10.	What is the purpose of bubble point method?
Option A:	To determine the pore size distribution
Option B:	To determine size of all pores
Option C:	To determine size of largest pore
Option D:	To determine membrane thickness
11.	What is the driving force in Microfiltration?
Option A:	Pressure difference
Option B:	Pervaporation
Option C:	Difference in fugacity
Option D:	Concentration difference
12.	Physical adsorption of a gaseous species may change to chemical adsorption with-- -----
Option A:	decrease in temperature
Option B:	increase in temperature
Option C:	increase in surface area of adsorbent
Option D:	decrease in surface area of adsorbent
13.	Which of the following is not characteristic of chemisorption?
Option A:	It is irreversible
Option B:	It is specific
Option C:	It is multilayer phenomenon
Option D:	Heat of adsorption is about 400kj

14.	What is the driving force in Dialysis?
Option A:	Pressure difference
Option B:	Pervaporation
Option C:	Difference in fugacity
Option D:	Concentration difference
15.	The gas molecules are held on solid surface by _____ in physical adsorption.
Option A:	Chemical forces
Option B:	Gravitational forces
Option C:	Electrostatic forces
Option D:	Vander Waal's forces
16.	Adsorption process must be
Option A:	Endoethrgic
Option B:	Endothermic
Option C:	Exothermic
Option D:	None
17.	Pine oil used in froth flotation technique acts as a/an
Option A:	Collector
Option B:	Modifier
Option C:	Activator
Option D:	Frothers
18.	Which of the following are the practical problems that arise due to the decrease in column diameter?
Option A:	Requirement of large particle size and high pressure drop
Option B:	Requirement of large particle size and low pressure drop
Option C:	Requirement of small particle size and high pressure drop
Option D:	Requirement of small particle size and low pressure drop
19.	Which of the following is the disadvantage of hydrogen, which can be used as carrier gas in gas chromatography?
Option A:	Dangerous to us
Option B:	Expensive
Option C:	Reduced sensitivity
Option D:	High density
20.	Which of the following methods are liquid samples injected into the column in gas chromatography?
Option A:	Gas tight syringe
Option B:	Micro-syringe
Option C:	Rotary sample valve
Option D:	Solid injection syringes

Descriptive Questions

Explain different modes of operation of a foam fractionation column
An industrial wastewater contains 10 mg/lit chlorophenol and is going to be treated by carbon adsorption. 90% removal is desired. The wastewater is discharged at a rate of 0. 1 MGD. Calculate the carbon requirement for a) A single, mixed contactor (CMFR) b) Two mixed (CMFR) contactors in series Freundlich isotherm $q = 6.74 \times C^{0.41}$
Explain in detail the supercritical fluid extraction process.
Derive the B.E.T. equation for adsorption.
What is chromatography? Explain paper chromatography and thin – layer chromatography.
What is membrane fouling? Explain the methods to reduce membrane fouling.
Explain the preparation of phase inversion membrane.
Write a note on: Molecular Sieves and Applications of Activated Carbon
Explain the following chromatographic processes (i) Gel Permeation Chromatography (ii) High Performance Liquid Chromatography
Explain in detail Pressure swing adsorption (PSA) technology and Thermal swing adsorption
What are the different modes of operation of foam fractionator
Explain in detail any one application of liquid chromatography.
What are the various Types of adsorbent. Explain with its characteristics and applications.
What are main components of liquid chromatography?
Derive the relation for liquid permeation process in series. i.e. $N_A = \frac{C_1 - C_2}{(1/kC_1) + (1/kC_2) + 1/P_m}$
What is reverse osmosis? Explain with process flow diagram? How sea water is desalinated by R.O. Technique.
What are the various techniques for characterization of membranes? Explain any one in details.
Explain foam formation, coalescence and drainage phenomena

Sample Questions

Chemical Engineering

Subject Name: Polymer Technology

Semester: VIII

Multiple Choice Questions

Choose the correct option for following questions. All the Questions carry equal marks	
1.	What happens to the polymer feed as it moves to compression section
Option A:	Polymer is heated to melting point
Option B:	Polymer is reduced in size due to compression
Option C:	polymer is torn
Option D:	Polymer is mixed
2.	Polymers are classified into four categories namely thermosetting, thermoplastic, elastomer and fibre depending upon their
Option A:	Molecular sizes
Option B:	Magnitude of intermolecular forces
Option C:	Resistance to heat
Option D:	Polymerisation mechanism
3.	In condensation polymerisation as compared to addition polymerisation
Option A:	The monomers are unsaturated compounds
Option B:	No co-product is lost
Option C:	The monomers contain two functional groups
Option D:	Generally only one monomer is involved
4.	Why does heat dissipation in bulk polymerization becomes progressively difficult with high conversions?
Option A:	increase in medium viscosity
Option B:	solubilization of polymer in the monomer
Option C:	precipitation of polymer in the monomer
Option D:	as reaction is very fast

5.	Which of the following natural bio-polymers are formed as a result of polymerisation of amino-acids?
Option A:	Starch
Option B:	Cellulose
Option C:	Proteins
Option D:	Nucleic acids
6.	Properties of polymers such as melt viscosity, impact strength or tensile strength depend on _____
Option A:	Molecular weight
Option B:	Equivalent weight
Option C:	Mass fraction
Option D:	Polymer processing
7.	Injection molding is preferred for _____
Option A:	Thermosetting polymers
Option B:	Rubbers
Option C:	Glasses
Option D:	Thermoplastics
8.	Condensation polymerisation of _____ produces Bakelite.
Option A:	Propylene
Option B:	Phenol & formaldehyde
Option C:	Phenol & acetaldehyde
Option D:	Urea & formaldehyde
9.	Silicone resins, which are highly water repellent and has good heat resistance cannot be used
Option A:	As room temperature adhesive
Option B:	As grease & lubricant
Option C:	Hydraulic fluid for heat transfer
Option D:	Resin for lamination
10	Every polymer has its Degree of polymerization value below which the polymer does not possess any strength that DP value is called as
Option A:	Threshold Point
Option B:	Necking point
Option C:	Plait point
Option D:	Inflection point

11.	What is the effect of the outdoor exposure on polystyrene?
Option A:	lowering of melting point
Option B:	crazing and yellowing
Option C:	increased brittleness
Option D:	Increased Strength
12.	Polyurethane cannot be used for making
Option A:	Mattresses & foam
Option B:	Coating Material
Option C:	Adhesives
Option D:	Bottles
13.	Why does heat dissipation in bulk polymerization becomes progressively difficult with high conversions?
Option A:	increase in medium viscosity
Option B:	solubilization of polymer in the monomer
Option C:	precipitation of polymer in the monomer
Option D:	as reaction is very fast
14.	_____ resins are produced by the condensation polymerisation of formaldehyde with urea or melamine.
Option A:	Epoxy
Option B:	Amino
Option C:	Alkyd
Option D:	Phenolic
15.	For synthetic polymers ratio of weight average molecular weight to number average molecular weight is
Option A:	Greater than 0
Option B:	Greater than 1
Option C:	Less than 1
Option D:	0
16.	_____ practically possess no elasticity.
Option A:	Vulcanite or ebonite
Option B:	Spandex fibre
Option C:	Polysulphide rubber
Option D:	Epoxy resin

17.	Viscosity average molecular weight is expressed based on
Option A:	Flow Behaviour
Option B:	Sedimentation behavior
Option C:	Degree of polymerization
Option D:	Diversity of monomers present
18.	Temperature and clamping pressure conditions in case of Reaction injection molding are _____ as compared to injection molding
Option A:	Low
Option B:	High
Option C:	Sever
Option D:	Unstable
19.	Advantage of using Reaction injection molding include
Option A:	Rapid start up, low energy consumption
Option B:	Ease of operation
Option C:	Compact set up
Option D:	No need of control on polymerization
20.	Polystyrene is a _____ plastic at room temperature.
Option A:	Ductile
Option B:	Brittle
Option C:	Malleable
Option D:	Fragile

Descriptive Questions

What are the methods to express the molecular weight of a polymer ?
Explain molecular weight distribution curve of a polymer and its significance
What is the effect of Stoichiometric Imbalance on Molecular weight ?
Explain in detail the phenomenon of polymer degradation, with regard to its types, 10 causes, effects and remedies.
Explain the need for incorporating additives in polymers.
What is the importance of glass transition temperature
What are the various ways of expressing molecular weight of Polymers? Derive expression for finding the weight average molecular weight
What are various unit operation that to be carried out post polymerization in polyester manufacturing? Explain in detail
Explain mechanism and kinetics of step growth polymerization
Write note on i) Factors affecting polymer properties
ii) Natural polymer Rosin

Explain detailed classification of polymers with examples
Explain in detail suspension polymerization technique with advantage disadvantage and an industrial example
Explain suspension polymerization system
Explain linear, branch and cross linked polymers
Discuss the kinetics of free radical Copolymerization
Write note on i) Extrusion ii) Emulsion Polymerization
Write note on i) Molecular weight distribution of polymers ii) Polydispersity iii) Auto-acceleration
Explain mechanism and kinetics of step growth polymerization
Write explanatory note on Mechanical Polymer Degradation
Describe Blow Molding for manufacture of hollow bottle
Explain various methods for determination of reactivity ratios