University of Mumbai
Online Examination 2020

Program: BE Chemical Engineering

Curriculum Scheme: Revised 2012

Examination: Fourth Year Semester VII

Course Code: CHC703

Course Name: Process Dynamics and Control

Time: 1 hour Max. Marks: 50

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

Q1.	The transfer function of a system is
Option A:	the ratio of Laplace transform of deviation variable of output to that of input
Option B:	the ratio of Laplace transform of deviation variable of input to that of output
Option C:	the ratio of deviation variable of output to that of input
Option D:	the ratio of deviation variable of input to that of output
Q2.	Write the steady state component balance of a blending model with inlet streams with mass flow rates w_1 and w_2 and mass fractions x_1 and x_2 respectively. The outlet mass flow rate is w with mass fraction x.
Option A:	$w_1+w_2=w$
Option B:	$w_1x_1+w_2x_2=wx$
Option C:	$w_1+w_2=wx$
Option D:	$w_1x_1+w_2x_2=0$
Q3.	Guidelines have been proposed for the selection of Controlled variables from among the input variables
Option A:	Select inputs that have large effects on controlled variables.

Option B:	Choose inputs that rapidly affect the controlled variables.
Option C:	Choose output variables that have favorable dynamic and static characteristics.
Option D:	The manipulated variables should affect the controlled variables directly, rather than indirectly
Q4.	The model developed using principles of chemistry, physics and biology only known as
Option A:	Theoretical models
Option B:	Empirical models
Option C:	Semi empirical models
Option D:	Experimentally fitted data model
Q5.	An input to a system, which increases with time
Option A:	step input
Option B:	impulse input
Option C:	sinusoidal input
Option D:	ramp input
Q6.	Phase angle (φ) of the sinusoidal response of a first order system is given by
Option A:	$\sin^{-1}(-\omega\tau)$
Option B:	$\tan(-\omega\tau)$
Option C:	$\tan^{-1}(\omega\tau)$
Option D:	$\tan^{-1}(-\omega\tau)$
Q7.	In a blending system, if the holdup volume of the tank is 4 ft^3 and volumetric flow to tank is 8 ft^3/min, then what is the time constant of the system?
Option A:	1 min
Option B:	2 min

Option C:	0.5 min
Option D:	0.25 min
Q8.	Control which is suitable economically if no offset and no oscillations is tolerable
Option A:	Proportional integral control
Option B:	Proportional control
Option C:	Proportional derivative control
Option D:	Proportional integral derivative control
Q9.	If two first order systems are connected in non- interacting manner, then overall transfer function is
Option A:	Product of transfer functions of individual systems
Option B:	Ratio of transfer function of second system to transfer function of first system
Option C:	Sum of transfer functions of individual systems
Option D:	Ratio of transfer function of first system to transfer function of second system
Q10.	A first order liquid level system is having outlet valve resistance R as 0.4 ft/cfm and cross-sectional area A of tank as $2ft^2$. What is the time constant of the system? (cfm is ft^3/min)
Option A:	1 min
Option B:	0.8 min
Option C:	2 min
Option D:	4 min
Q11.	The degree of freedom is given as (where N_F= Degree of freedom, N_V= Number of variable, N_E = Number of equation)

Option A:	$N_F = N_V - N_E$
Option B:	$N_F = N_V + N_E$
Option C:	$N_F = N_V - N_E + 2$
Option D:	$N_F = N_V + N_E + 2$
Q12.	_____ can be estimated from a step response plot using the value of *t* at which the response is 63.2% where all carry usual notations of first order system
Option A:	Gain
Option B:	Time constant
Option C:	Transfer function
Option D:	Input
Q13.	The addition of integral action to proportional control
Option A:	Increases the value of offset
Option B:	take the controlled variable to new steady state
Option C:	eliminates the offset
Option D:	Arrest the Rise of controlled variable more quickly
Q14.	Transfer function for a Proportional controller is
Option A:	$P(s)/\epsilon(s) = Kc[(1/\tau_I s)+\tau_D s]$
Option B:	$P(s)/\epsilon(s) = Kc$
Option C:	$P(s)/\epsilon(s) = Kc(1/\tau_I s)$
Option D:	$P(s)/\epsilon(s) = Kc[1- (1/\tau_I s)+ \tau_D s]$
Q15.	In a control system, generally control valve is used as
Option A:	controller

Option B:	measuring element
Option C:	process
Option D:	final control element
Q16.	If controlled variable is equal to set point in a feedback control system, then
Option A:	error =1
Option B:	error = 0.
Option C:	error >1
Option D:	error < 1
Q17.	According to the bode stability criteria, for stable system relation between Gain Margin (GM) and Phase Margin is represented by
Option A:	PM =GM
Option B:	PM > GM
Option C:	PM < GM
Option D:	PM =1/GM
Q18.	The characteristic equation for negative feedback control system is----------, if open loop transfer function is G(s)
Option A:	1+ G(s) =0
Option B:	1-G(s) =0
Option C:	1/G(s) =0
Option D:	G(s) =0
Q19.	The number of sign changes in first column of Routh array indicates the number of roots lying in
Option A:	center of the s-plane

Option B:	right half of s-plane
Option C:	left half of s-plane
Option D:	origin of s-plane
Q20.	Among the mentioned integral control criteria for controller design which is most preferred?
Option A:	ISE
Option B:	IAE
Option C:	ISTE
Option D:	ITAE
Q21.	If the process of interest can be approximated by a first-order or second-order linear model, the model parameters can be obtained by inspection of
Option A:	Process Reaction Curve
Option B:	Process Intensification
Option C:	Process Linearization
Option D:	Process Curve
Q22.	Phase angle (ϕ) vs. ω in Bode plot is made on a\an ……. graph paper.
Option A:	ordinary
Option B:	semi-log
Option C:	log-log
Option D:	triaxial
Q23.	Amplitude Ratio for 2nd order system is
Option A:	Less than 1
Option B:	Greater than 1

Option C:	Equal to1
Option D:	Equal to 0
Q24.	The least-squares solution provides _____ for the unknown model parameters
Option A:	Point estimate
Option B:	Integral solution
Option C:	Differential solution
Option D:	Approximate solution
Q25.	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.

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Question	Correct Option (Enter either 'A' or 'B' or 'C' or 'D'
Q1.	A
Q2.	B
Q3.	C
Q4	A
Q5	B
Q6	D
Q7	C
Q8.	D
Q9.	A
Q10.	B
Q11.	A
Q12.	B
Q13.	C
Q14.	B
Q15.	D

Q16.	B
Q17.	B
Q18.	A
Q19.	B
Q20.	D
Q21.	A
Q22.	B
Q23.	A
Q24.	A
Q25.	C