Q. Code: 946009

Reg. No. | | | | | | | | | |

M.E. / M.TECH. DEGREE EXAMINATIONS, MAY 2019

Second Semester

CL18203-ADVANCED PROCESS CONTROL

(*Chemical Engineering*)

(Regulation 2018)

Time: Three Hours **Maximum : 100 Marks**

Answer **ALL** questions

PART A - (10 X 2 = 20 Marks)

1. State servo problem in CSTR.
2. Define split range control and its applicability in advanced process control.
3. State the static control law in model based control?
4. Write the structure of IMC closed loop system equivalent conventional control form?
5. Can you explain why controller should be tuned for its better performance?
6. Write a note on RGA? Give its importance.
7. What is the factorization method used in IMC design?
8. What is an impulse sampler?
9. Define the theorem translation of F(Z).
10. Write down the effect of sampling in digital feedback control system.

PART B - (5 X16 = 80 Marks)

11. (a) Explain principle involved in feed forward control and compare it with simple feedback control for the same system. **(16)**

(OR)

(b) Explain principle involved and its applications of Smith predictor (dead time compensator) with an example. **(16)**

12. (a) Explain the structure and design procedure of IMC with block diagram. Also derive its transfer function. **(16)**

(OR)

(b) Design an IMC controller for a first order process with the transfer function $G(s) = K/(\tau s + 1)$, For this case $Gm_a = 1$ and $Gm_m = K/(\tau s + 1)$. **(16)**

13. (a) Explain the RGA and its applications in MIMO system in detail. **(16)**

(OR)

(b) (i) Discuss in detail the Control loop interaction in MIMO system. **(8)**

(ii) Explain Directional sensitivity and operability in multivariable control. **(8)**

14. (a) (i) Determine the pulse transfer function for the first order system. **(6)**

(ii) Check the stability of the MIMO system with the transfer function **(10)**

$G_{11} = (S+5)/(S+1)(S+7)$, $G_{12} = 4/(S+1)(S+7)$

$G_{21} = 4/(S+1)(S+7)$, $G_{22} = 2(S+3)/(S+1)(S+7)$

$G_{c11} = K_1$, $G_{c22} = K_2$, $G_{c12} = G_{c21} = 0$

(OR)

(b) Determine the Z-Transform of the function $F(s) = 1/ (s^2+ 2s+1)$ and check its stability. **(16)**

15. (a) Design a deadbeat controller for a first order process with a step change in the set point of magnitude 12 and assume zero order hold. **(16)**

(OR)

(b) Design a digital feedback controller in position and velocity forms. **(16)**