M. Tech. First Semester (Chemical Engineering) (CBS) -

13003 : Process Control : 1 CE 3

P. Pages : 2
Time : Three Hours

* 0 7 3 1 *

AW - 3445
Max. Marks : 80

Notes : 1. Answer **any six** questions.
2. Question No. **1** is compulsory.
3. Assume suitable data wherever necessary.
4. Illustrate your answer necessary with the help of neat sketches.

1. Discuss feed forward control and mention tuning rules for feed forward feed back control. **15**

2. Explain Internal Model Control (IMC) and discuss design of IMC controllers. **13**

3. Describe mathematical model of an ideal binary distillation column. **13**

4. What is meant by adaptive control system? How many different types of adaptive control system? Discuss Model-Reference Adaptive Control (MRAC) and its recent development. **13**

5. Define direct digital and supervisory control which one is used for regulatory control actions & which for servo operations? In a supervisory control mode, what are better as local controllers, analog or digital devices? **13**

6. Plot the root locus diagram for a system with the following open loop transfer function **13**

$$G(s) = \frac{2k_s}{s^2 + 1}$$

Determine the value of K at the break in the point.

7. a) Obtain the z-transforms for **6**

i) Ramp function

ii) Impulse function

iii) Exponential function

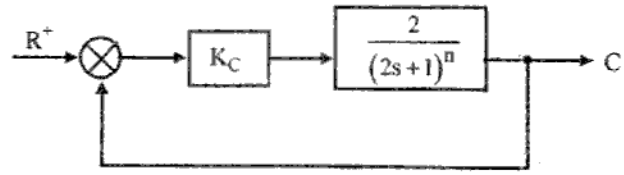
b) Find the inverse z-transform of $\frac{3z}{(z-1)(z-0.4)}$ by method of partial fraction. **7**

8. a) Discuss Ziegler – Nichols controller settings. **7**

b) Calculate the value of gain 'K_C' needed to produce continuous oscillations in the control system shown in fig-when 6

a) n is 2

b) n is 3



9. a) The open loop transfer function of a control system is given as, 9

$$G(s)=\frac{1}{(s+1)(s+6)}$$

sketch the Nyquist diagram.

b) Describe gain margin & phase margin with sketch. 4

10. a) Calculate analytically the ultimate gain for the transfer function 7

$$G(s)=\frac{k}{(s+1)^3}$$

b) Obtain the transfer function for Damped oscillator. 6

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