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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
07 THRISSUR CLUSTER**

FIRST SEMESTER M.TECH. DEGREE EXAMINATION DEC 2017

Chemical Engineering Department

(Process Control)

07CH 6103 Process Dynamics and Control I

Time: 3 hours

Max. Marks: 60

Answer all six questions. Part 'a' of each question is compulsory.

Answer either part 'b' or part 'c' of each question

(Semi logarithmic and ordinary graph sheets shall be provided.)

Q.no.	Module 1	Marks
1a	Explain Bode and Nyquist stability criterion.	4
Answer b or c		
b	A feedback control system has a characteristic equation $S^2 + 2S^5 + 9S^4 + 16S^3 + 24S^2 + 32S + 16$. Determine the number of poles	5
	1. On the right half of the S-plane.	
	2. On imaginary axis.	
	3. On the left half of S-plane.	
c	Derive the frequency response of P, PI, PD, PID controllers.	5
Q.no.	Module 2	Marks
2a	Write down the describing function for various nonlinearities in a process	4
Answer b or c		
b	Explain the characteristics of nonlinear systems.	5
c	Draw the phase trajectory of the system $\ddot{a} + 4\dot{a} + 2a$. Comment the stability of the system	5
Q.no.	Module 3	Marks
3a	Explain with a neat sketch the characteristics of a control valve.	4
Answer b or c		
b	Draw and explain pneumatic controllers.	5
c	Describe valve sizing and valve positioners.	5

Q.no.	Module 4	Marks
4a	Explain the working of cascade control with a neat sketch and block diagram. List out the advantages of cascade control over the feedback control system.	4

Answer b or c

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|---|--|---|
| b | Explain various error performance indexes used as performance criteria of controllers. | 5 |
| c | Problem-tuning | 5 |

Q.no.	Module 5	Marks
5a	What is adaptive control? Discuss its applications in chemical process control.	5

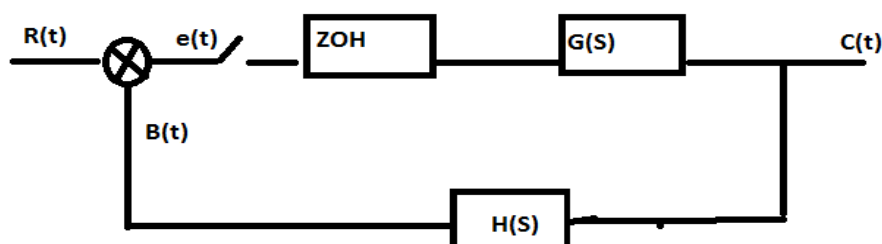
Answer b or c

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|---|--|---|
| b | Explain with the help of block diagram
1. Sampling
2. Zero order hold
3. Impulse modulated function | 7 |
| c | Elucidate with the help of block diagram
1. Self tuning regulator
2. Dead time compensator | 7 |

Q.no.	Module 6	Marks
6a	Invert $F(z) = \frac{5Z}{(Z-1)(Z-2)}$	5

Answer b or c

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|---|--|---|
| b | Find the closed loop sampled data response of the following control systems. | 7 |
|---|--|---|



Where $ZOH = \frac{1-e^{-sT}}{s}$; $G(s) = \frac{1}{s+1}$; $H(s) = 1$

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| c | Find the stability of the sampled data control systems described by the characteristic equation $z^3 + 3z^2 - 2.75z + 0.75 = 0$. | 7 |
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