



B.E DEGREE EXAMINATIONS: MAY 2017

(Regulation 2014)

Sixth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U14EIT 604: Process Dynamics and Control

COURSE OUTCOMES

- CO1:** Distinguish various dynamics and control techniques to different processes.
CO2: Analyze the stability for Chemical Reactors.
CO3: Identify the principles and practices for system design and development to plant Operations.
CO4: Differentiate between the different control schemes in boiler optimization
CO5: Acquire adequate knowledge about the dynamics and control of Heat Exchangers and Boilers.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. In Petroleum Refineries:

CO5 [K₂]

List I	List II
A. Bitumen	i. 200°C
B. Diesel	ii. 150°C
C. Kerosene	iii. 300°C
D. Naphtha	iv. 400°C

- | | A | B | C | D |
|----|-----|-----|----|-----|
| a) | iv | iii | i | ii |
| b) | i | iv | ii | iii |
| c) | i | ii | iv | iii |
| d) | iii | iv | ii | i |

2. In fractional distillation column, the mixture of liquids is separated based on their_____.

CO3 [K₂]

- | | |
|-------------------------|---------------|
| a) Chemical composition | b) Solubility |
| c) Boiling point | d) Density |

10. Which one of the following is the largest lag in a distillation column_____.
- a) Concentration lag in liquid hold up b) Lags in liquid flow
- c) Lags in vapor flow d) Concentration lag in vapor hold up
- CO4 [K₂]

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11. State working principle of the heat exchanger when more number of parallel tubes are used. CO1 [K₂]
12. Mention the need for the derivative controller in a Heat exchanger. CO1 [K_L]
13. Which is the best flow meter for measuring the steam flow rate? CO2 [K_L]
14. Define inverse response of a boiler. CO2 [K_L]
15. Analyze the effects of Time constant in a Plug Flow reactor. CO3 [K_L]
16. Discuss about the stability in chemical reactors. CO3 [K_L]
17. What is meant by concentration lag? CO4 [K_L]
18. Mention the different types of distillation column. CO4 [K_L]
19. What is the need for reflux flow control in a distillation column? CO5 [K_L]
20. List the various unit operations involved in sugar manufacturing plant. CO5 [K_L]

Answer any FIVE Questions:-

PART C (5 x 14 = 70 Marks)

(Answer not more than 300 words)

Q.No. 21 is Compulsory

21. Discuss in detail about the various unit operations that are involved in the production of making of Cement manufacturing process. CO5 [K₂]
22. Discuss in detail about the various control mechanisms that are involved to run the turbo alternator with safe and efficient condition during the superheated steam extraction to operate the turbines. CO2 [K₂]
23. Discuss in detail about the various techniques involved in the detection of outlet product of a CSTR and summarize the different control schemes that are used to maintain process variable at the desired level of concentration. CO3 [K₂]

24. Detail an overview about the different types of lag introduced in a distillation column during its separation process. CO4 [K₂]
25. (i) Obtain the transfer function of shell and tube heat exchanger. (7) CO2 [K₂]
(ii) Discuss in detail about the safety locking system used in a boiler during critical condition. (7)
26. Discuss in detail about how the exit fluid temperature can be controlled by using various control schemes in a heat exchanger. CO1 [K₂]
27. Design a distillation column for separating a mixture of pentane and hexane and also design the possible control schemes to maintain the 95% purity of pentane. CO3 [K₂]
