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**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_\_

**End Semester Examination – Nov/Dec - 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **11ME205** | **Duration :** | **3 hrs** |
| **Sub. Name:** | **Design of Heat Exchangers and Pressure Vessels for Food Processing** | **Max. marks:** | **100** |

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| **Q. No.** | **Questions** | | | | | **Marks** | |
| **PART-A(10X1=10 MARKS)** | | | | | | | |
| 1. | The unit of overall heat transfer co efficient is ----------------. | | | | | (1) | |
| 2. | The LMTD for counter flow will be ------------ than the parallel flow. | | | | | (1) | |
| 3. | Baffles will be used in shell side to increase -------------. | | | | | (1) | |
| 4. | In shell and tube heat exchanger the U will be near to that of ------------ side fluid. | | | | | (1) | |
| 5. | Two types of condensation are -------------- and --------------. | | | | | (1) | |
| 6. | Turbulence will be maximum in ----------- side in shell and tube heat exchanger. | | | | | (1) | |
| 7. | Regenerative heat exchangers are -----------------. | | | | | (1) | |
| 8. | The heat transfer rate for viscous fluids can be enhanced by incorporating ------------. | | | | | (1) | |
| 9. | Entrainment separators are used to trap --------------- from the vapor. | | | | | (1) | |
| 10. | For concentrating orange juice --------------- tube vertical evaporators are used. | | | | | (1) | |
| **PART B(5 X 3= 15 MARKS)** | | | | | | | |
| 11. | | Differentiate parallel flow and counter flow of fluid in case of double pipe heat exchanger. | | | (3) | | |
| 12. | | What is AMTD? | | | (3) | | |
| 13. | | In condensation, which type is more preferable and why? | | | (3) | | |
| 14. | | What is the difference between recuperative and regenerative heat exchangers? | | | (3) | | |
| 15. | | What is boiling point elevation and how to overcome this in multiple effect evaporators? | | | (3) | | |
| **PART C(5 X 15= 75 MARKS)** | | | | | | | |
| 16. | | | a. | Derive the expression for overall heat transfer coefficient based on inner surface and outer surface in the case of double pipe heat exchanger. | | | (10) |
| b. | What is the significance of LMTD? | | | (5) |
| (OR) | | | | | | | |
| 17. | | |  | An oil pipe line di/do = 44/51 mm in the diameter is covered with a layer of concrete, 80mm thick. The thermal conductivity of pipe line material is 43 kcal/hr m°C and that of concrete is 1.1 kcal/hr m°C. The mean temperature of the oil is 120°C and the ambient air temperature 25°C. The total coefficient of heat transfer from oil to the wall is 86 kcal/hr m2°C and that from the concrete surface to the air is 8.6 kcal/hr m2°C. Calculate the loss of heat from length of 1 meter of a bare pipeline and from the same length of the pipeline covered with concrete. | | | (15) |
| 18. | | | a. | Explain the construction and operation of 1-2 shell and tube heat exchangers. | | | (12) |
| b. | What is the purpose of baffles in the shell and tube heat exchangers? | | | (3) |
| (OR) | | | | | | | |
| 19. | | |  | Classify heat exchangers based on principle of operation, flow pattern and on its function. | | | (15) |
| 20. | | |  | Water enters a double pipe heat exchanger at 55°C and leaves at 85°C and hot gas enters at 305°C and leaves at 160°C. The total heat transfer area is 500 m2 and the overall heat transfer co efficient is 600 Kcal/hr.m2°C. Determine the heat transfer rate per hour for parallel flow and counter flow of the two fluids. | | | (15) |
| (OR) | | | | | | | |
| 21. | | |  | Explain the mechanism of two types of condensation in detail. | | | (15) |
| 22. | | | a. | Starting from the material balance, obtain the design equation for the case of continuous stirred tank reactor. | | | (12) |
| b. | What is space time and space velocity? | | | (3) |
| (OR) | | | | | | | |
| 23. | | |  | Acetic anhydride is hydrolyzed in a CSTR by using large excess of water. The concentration of acetic anhydride in the initial mixture is CA0 0.3 mole/lit. The degree of conversion with respect to the initial mixture is 0.7. The volumetric flow rate of initial mixture is 20 lit/min. The reaction is first order having reaction rate constant K = 0.38 min-1. Estimate i). Volume of a single CSTR required for the desired degree of conversion. ii). Volume of the plug flow reactor for the same process. | | | (15) |
| 24. | | |  | Explain with neat sketch the construction and operation of calendria type evaporator. | | | (15) |
| (OR) | | | | | | | |
| 25. | | |  | What are the methods of feeding the multiple effect evaporators? Explain with neat sketch. | | | (15) |

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