Ref no : EX /FTBE/PE/B/T/422B/2024

B F. T. B. E. –FOURTH YEAR---SECOND SEMESTER EXAMINATION 2024

PLANT OPERATION , MAINTENANCE AND SAFETY

FULL MARKS -100 TIME-3 HOURS

ANSWER ANY FIVE QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. (A) Illustrate the effects of interactions in a system , considering two processing units ,viz, a heat exchanger and a catalytic reactor. (10)

   (B) With a schematic diagram for a counter current flow heat exchanger , develop the information flow diagram for operational variables using degrees of freedom. (10)

2. (A) Draw a material flow diagram of an extraction process consisting of the following equipments :
   A mixing tank with a stirrer,
   A settler ,
   A still having heating source,
   A heat exchanger for cooling purpose,
   Also assume recycling of any stream in the process to increase product quantity,
   Further any additional stream for make up flow in the process. (6)

   (B) Describe how the system information flow structure of the above process can be constructed from structure of the several subsystems which compose the special conditions to be imposed on the system operation. (14)
3. Three numbers of similar type of evaporators are connected with three numbers of similar type of heat exchangers to cool the vapor from evaporators. There is design options for flow operation information to arrange the equipments in the process. What is the probability of obtaining arrangements for operation when
   A) all evaporators,
   B) two evaporators,
   C) one evaporator,
   D) at least one evaporator,
   E) at least two evaporators,
   F) at least two evaporators,
   G) all heat exchangers are considered. (20)

[Turn over

4.An antibiotic manufacturing plant has seven (7) reactors to produce antibiotic having same types of operations and capacities. It is hypothetically expected that all seven (7) reactors have the equal potential to produce antibiotic of expected optimum efficiency equivalent to 200 mg / capsule. It is required to test the hypothesis that 7 reactors have equal potential using a level of significance of 0.05.
The following test data have been collected at a certain interval of operation on the basis of a probabilistic optimum production model.

Reactor No	A	B	C	D	E	F	G	
Efficiency of Antibiotic Mg/ capsule	120	185	260	190	210	175	260	(20)

5. (A) Describe the steps involved for preparing of HAZOP appraisal. (10)

(B) .Discuss the techniques involved for inspection of major hazard works. (10)

6. Describe the methods of reporting of accident analysis with respect to various resources. (20)

7. Illustrate how one can carry out the steps of safe maintenance in a food and drink manufacturing unit ? (20)

8. Write short notes on : Any Four (4) 5*4 = 20

A) Reversal of information flow,

B) Preventive maintenance,

C)Cost reduction in a maintenance process,

D) Failure models,

E) System of safety control