

## B.E. CHEMICAL ENGINEERING FOURTH YEAR SECOND SEMESTER EXAM 2018

## CHEMICAL PROCESS SAFETY &amp; RISK MANAGEMENT

Answer any five questions

All questions carry equal marks

Time 3 hours

Full marks 100

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Q1.	With the help of examples, state the possibilities of accidents that may be caused by human error from the following cases: (a) Wrong valve closed (b) Wrong valve opened (c) Abnormal reading unnoticed on panel instrument. (4+6+10)	CO1
Q2.	Discuss about the typical pipe and valve failures and give also the reasons for their occurrence for the following cases (a) Dead end formation at a steam connection (b) Corrosion resulting from collected water (c) Water collected in a dead end	CO1
Q3.	Write short notes on any four (4x5) (a) Temperature deviation in reactors (b) Confined explosion (c) Runaway reactions (d) Failure mode of separation vessels (e) Classes of hazardous substance (f) Failure of utilities and ancillary systems (g) Guide words of HAZOP study	CO1
Q4.	(a) What are the different causes of accidents in chemical industries (b) Discuss about possible failures and hazards associated with reactor	CO2
Q5.	(a) What are the different classes of fire? (b) What are the different fire extinguishers used for different classes of fire? (c) Discuss about unconfined vapor cloud explosion and blast wave? (4+6+10)	CO3
Q6.	(a) What do you mean by HAZOP? (b) Define the following terms STUDY NODE. INTENTION, DEVIATION, CAUSES, CONSEQUENCES (c) What could be the causes of the following Deviations: abnormal pressure, material flow stoppage, failure of the equipment (3+5+12)	CO4

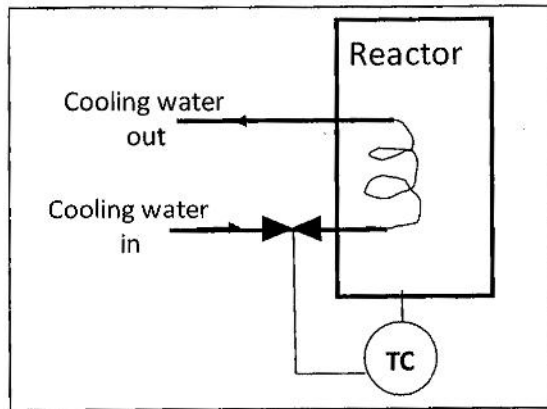
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Q7.

Consider the reactor system shown in the figure. The reaction is exothermic. A cooling system is provided to remove the excess energy of reaction. In the event the cooling function is lost, the temperature of the reactor would increase. This would lead to an increase in reaction rate leading to additional energy release. The result could be a runaway reaction with pressures

CO4

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exceeding the bursting pressure of the reactor. temperature within the reactor is measured and is to control the cooling flow rate by a valve. Perform a HAZOP on this to improve the safety of process. Apply the guide words to the cooling coil inlet for the parameter FLOW. The design intention is cooling. State the causes, consequences and recommendations in successive columns of a table.

(20)