MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

VII SEMESTER B.TECH. (CHEMICAL ENGINEERING)

ENDSEM EXAMINATIONS, DEC 2020

SUBJECT: PE-IV PROJECT ENGINEERING [CHE 4023]

REVISED CREDIT SYSTEM
(28/12/2020)

Time: 3 Hours   MAX. MARKS: 50

Instructions to Candidates:

❖ Answer **ALL** the questions.
❖ Missing data may be suitable assumed.

1.A	Explain the importance of tangible factors raw material and different modes of transportation for the selection of plant site.	6
1.B	Write the instrumentation symbols for the following: combined dual service board mounted manual flow recording controller number 3 connected to equipment through pneumatic transmission, locally mounted pressure recorder number 2 by mechanical transmission to equipment.	3
1. C	What is the meaning of $1^{11}O2118E$ with respect to piping and instrumentation?	1
2.A	Discuss the different types of stresses experienced by a piping system and suggest any one general method for relieving the piping stresses.	4
2.B	Water is considered as one of the important utility required and is used for different purposes in industry. Discuss how the water can be used as process water, boiler water, cooling water and sanitary water and the possible treatments given.	6
3.A	Discuss about block and blanket and molded insulation erected on the equipment to conserve valuable process heat.	7
3. B	Explain the importance of bench-scale, pilot plant scale and commercial scale level of process development.	3
4.A	Discuss the different stages in the fire formation.	2

4.B	The filtering characteristics of an aqueous slurry given by the equation $Q = (K\theta_f)^{0.5} A$, such that K value is 1.45×10^{-6}, where Q is tons of filtrate in filtering time of θ_f hours, A is area of the filter, m^2. The slurry is to be filtered at constant pressure in a plate and frame filter press (with a=0.25) at a rate to process an average of 1.35 ton/hr of feed and it is to be washed with an equal amount of water equal to one-eighth the volume of the filtrate. The dumping and assembling time is established at 6 hr. The direct costs for power, labor during filtering and washing are Rs. 14 per m^2, and cleaning cost Rs. 10 per m^2. The plant operates 6000 hr/yr and the slurry feed contains 11 per cent (weight) solids and the cake contains 73 per cent solids. Annual fixed costs may be taken as Rs. 20 per m^2 of filtering area. What is the minimum annual cost and the optimum cycle time?	8

5.A	With a neat sketch explain the working of solid expansion thermometers.	3

5.B	Draw a PERT network diagram for a construction project with the information given below and calculate the project completion time.	7

Job i-j		Optimistic	Most likely	Pessimistic
Successor event j	Predecessor event i	duration (weeks)	duration (weeks)	duration (weeks)
100	90	6	8	10
90	80	3	5	7
80	60	7	9	11
90	70	6	8	12
80	50	2	4	6
70	50	0	0	0
60	20	6	8	12
70	30	10	12	14
60	50	0	0	0
50	40	8	10	12
40	20	3	6	9
30	10	4	6	8
40	10	6	8	12
20	10	2	4	6