Exam Date & Time: 05-Dec-2023 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SEVENTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, NOV/DEC 2023
PROJECT ENGINEERING [CHE 4069]

Marks: 50   **Duration: 180 mins.**

A

Answer all the questions.   Section Duration: 180 mins

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1)

A) Discuss the various preliminary data to be collected regarding weather conditions such as wind direction, wind load on structure and relative humidity for the selection of the plant site. (3)

B) Explain the terms: running over of preliminary estimates in process engineering; cost plus contract in process engineering; royalties in manufacturing cost and beltline railroad (4)

C) Discuss maintenance facilities and plant roadways under utilities required for the operation of the plant. (3)

2)

A) Discuss 90° street elbow, tee and union as pipe fittings used for transportation of fluids. (3)

B) Explain the general methods used to relieve piping stresses in petrochemical complex. (3)

C) The shear stress in the flowing fluid exists due to the viscosity of the flowing fluid and it is dependent on the following factors density of the fluid, characteristic length through which the fluid is flowing, velocity of the fluid, viscosity and roughness of the pipe. Using the method of Buckingham method, develop the expression for shear stress in terms of other parameters which shows the behavior of the system. (4)

3) Draw the PID instrumentation symbol for the following description:

A) Combined dual service locally mounted pressure recorder number 2 connected to the equipment through mechanical means, board mounted manual pressure recording controller number 8 and pressure recording controller connected to the valve and transmitter by pneumatic means, transmitter to the equipment through pneumatic means, valve to equipment mechanical means (3)

B) For the given data, draw a network diagram for a construction project.

(5)

Activity i-j		Duration time (weeks)
Successor event j	Predecessor event i	
2	1	3
4	2	3
3	2	3
3	4	0
6	4	5
5	3	6
6	5	0
8	6	9
7	5	5
9	8	5
10	9	6
8	7	0
9	7	3

Estimate the project completion time and the critical path.

C)   Discuss cold strength and mechanical spalling with respect to refractories.

(2)

4)

A)   A filtration process is carried out in a leaf filter. The filtering characteristics is given by the equation $Q=A (K \theta_f)^{0.5}$, where Q is the tons of filtrate obtained per cycle and A is the area of filtration and $K =1.25 \times 10^{-6}$. The slurry is to be filtered in a leaf filter (a=1) with a filtration duty of 4500 tons/ year. The cake is not washed. The dumping and assembling time is established at 5 hrs. The direct costs for power, labor during filtering and dumping are ₹ 12 per m^2, and annual fixed costs ₹ 18 per m^2. The plant operates for 3500 hour/ year. Determine the minimum annual cost by graphical method?

(5)

B)   Explain the working of solid type fire extinguishers used for extinguishing fire.

(2)

C)   Draw the PID symbol for (i) open plug valve having butt welding with the pipeline

(ii) closed globe valve having flanged connection with the pipeline

(iii) symbol for electric line and symbol for 3-way ball valve

(3)

5)

A certain batch operation requires a batch time of 8 hrs permitting the operation to be completed in on shift. The annual fixed cost varies with the size of the batch as follows.

A)

$$C_F = 10 Q_B^{1.2}$$ where Q_B is batch size in kg.

(4)

The cost affecting the batch size including charging and discharging cost are Rs. 456 per batch with an operating cost of Rs. 18/hr and the other cost varies as $\frac{Q_A^2}{10^6}$ Rs/yr. where QA is annual production. What is the optimum batch size to produce 0.1 million kg per year of the product?

B) Discuss the Searle's experiment for determining the thermal conductivity of a material. (4)

C) Discuss the special permission to be obtained by the management from the government for starting the new industry in a foreign country. (2)

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