Enrollment No. _____

Shree Manibhai Virani and Smt. Navalben Virani Science College (Autonomous), Rajkot

Affiliated to Saurashtra University, Rajkot

SEMESTER END EXAMINATION NOVEMBER 2018

B.Sc. Industrial Chemistry

16UICCC19 – PRINCIPLES OF CHEMICAL ENGINEERING -I

Duration of Exam – 3 hrs ***Semester – V*** ***Max. Marks – 70***

Part A (10x1= 10 marks)

Answer **ALL** questions

1. What do you mean by the term aerodynamics?
2. Give units of viscosity in CGS?
3. What do you mean by the term forced convection?
4. Give units of thermal resistance?
5. Give one example of natural convection.
6. What is reflux ratio?
7. What is meant by comminution?
8. Define the term density. Give its unit.
9. Write principle of Gyratory crusher.
10. Enlist any two principles of crushing and grinding.

Part B (5x5= 25 marks)

Answer **ALL** questions

11a. Draw the diagram of U-tube manometer. Give its construction and working.

OR

11b. Measurement of pressure at the base and top of the mountain are 74 & 60 cm of Hg. Calculate the height of the mountain if air has density of 1.22 Kg/m^3.
Given density of Hg=13.6 x 103 kg/m^3.

12a. Enlist any five technical points for the following industrial thermal inulators:
i) Asbestos
ii) Glass wool

OR

12b. Determine the rate of heat flow through a boiler wall made of 20mm steel plate (k=58W/m.K). The outer surface of the boiler wall is cover with asbestos insulator (k=0.116 W/mK) is 5mm thick. The temperature of outer surface & the inside are 50 K & 300K respectively. Assume area of cross section = $1m^2$)

13a. Give mass and energy balance over vacuum crystallizer.

OR

13b. Give mass and energy balance over an evaporator.

14a. Define the following:
i) Ductility
ii) Malleability
iii) Fatigue
iv) Plasticity
v) Elasticity

OR

14b. Define the following:
- i) Tensile strength
- ii) Compressive strength
- iii) Yield strength
- iv) Shear stress
- v) Shear strain

15a. Draw a neat diagram of Jaw crusher. Give its construction and working.

OR

15b. Draw a neat diagram of Roll crusher. Give its construction and working.

Part C ***(5x7= 35 marks)***

Answer **ALL** questions

16a. Draw labeled diagram of Venturimeter. Give its construction and working.

OR

16b. Draw labeled diagram of Rectangular notch. Give its construction and working.

17a. A flat furnace wall is constructed of 114mm layer of special brick (k=0.138 W/mK) backed by 229mm layer of common brick (k=1.38 W/mK). Temperature of inner surface is 760 K & outer surface is 77 K. Calculate:
- i) What is the heat loss through the wall?
- ii) If the contact between two brick layer is poor & that contact resistance of 0.948 K/W is present. What would be heat loss? Consider area =1 m^2.

OR

17b. A 30 cm outer diameter pipe covered with two layers of insulation. First insulation is 5cm thick (k=0.09 W/mK) & outer insulation is 7cm thick (k=0.06 W/mK). Inner & outer surface temperature are 350 K & 50 K. Calculate:
- i) Heat loss per meter length of pipe.
- ii) Temperature at the interface between two insulator.

18a. Enlist various steps for calculating number of theoretical plates required for a distillation column using McCabe & Thiele method. Draw required graph to support explaination.

OR

18b. Derive an equation for lower operating line with a neat diagram.

19a. What is meant by crushing efficiency and mechanical efficiency? Derive equation for the same.

OR

19b. Write a note on :
- i) Rittinger's law ii) Kick's law iii) Bond's law

20a. Explain principle, diagram, construction and working of Hammer mill.

OR

20b. Explain principle, diagram, construction and working of Gyratory crusher.