Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination
August, 2018

Level : B.E.
Year : III
Course : CHEG 310
Semester : II

Exam Roll No. :
Time: 30 mins.
F. M. : 10

Registration No.:
Date AUG 1 2 2018

SECTION "A"
[20 Q. × 0.5=10 marks]

Attempt *ALL* questions. Tick the most appropriate answer.

1. Short distance transportation of grain, gravel, sand, ash, asphalt etc. is done by using a _____ conveyor.
   a. flight b. slat or drag c. ribbon d. screw

2. Energy requirement (per unit mass of material crushed/ground) is highest for
   a. jaw crusher b. rod mill c. all mill d. fluid energy mill

3. Wet sieving is employed, when the product contains _____ materials.
   a. abrasive b. large quantity of very fine
   c. coarse d. non-sticky

4. _____ is used for producing a thick suspension from thin slurry.
   a. Cartridge filter b. Rotary drum vacuum filter
   c. Pressure filter thickener d. Plate and frame filter press

5. Vertical transportation of materials can be done by a/an
   a. apron conveyor b. pneumatic conveyor
   c. bucket elevator d. both (b) & (c)

6. Which of the following parts of a jaw crusher is subjected to maximum wear and tear during its operation?
   a. Check plates b. Jaw plates c. Toggles d. Crush shaft

7. Which of the following is not used as a filter medium in case of corrosive liquids ?
   a. Nylon b. Glass cloth
   c. Metal cloth of monel or stainless steel d. Cotton fabric

8. A compressible cake has the
   a. maximum porosity at the upstream side
   b. maximum porosity at the filter medium
   c. same porosity throughout the cake thickness
   d. none of these

9. The grinding in a hammer crusher takes place due to the
   a. attrition b. impact c. both (a) & (b) d. neither (a) nor (b)

10. Cyclones are used primarily for separating
    a. solids b. solids from fluids c. liquids d. solids from solids

11. A propeller agitator
    a. produces mainly axial flow
    b. is used for mixing high viscosity pastes
    c. runs at very slow speed (2 rpm)
    d. all (a), (b) and (c)

12. Filter medium resistance is important during the _____ of filtration.
    a. early stages
    b. final stages
    c. entire process
    d. none of these.

13. Hot, lumpy & abrasive materials are best transported by using a/an _____ conveyor.
    a. apron
    b. belt
    c. screw
    d. flight

14. Filtration should be stopped in a filter press, if the
    a. cake becomes very dense
    b. liquor stops flowing out to the discharge
    c. filtration pressure rises suddenly
    d. both (b) & (c)

15. In constant pressure filtration,
    a. resistance decreases with time
    b. rate of filtration is constant
    c. rate of filtration increases with time
    d. rate of filtration decreases with time

16. Angle of nip of the crushing rolls does not depend upon the
    a. diameter of the rolls
    b. speed of the rolls
    c. product size
    d. feed size

17. _____ are mixed using ribbon blenders
    a. Lumpy solids and low viscosity liquids
    b. Dry powders
    c. High viscosity liquids
    d. Thick pastes

18. In case of a hammer crusher, the final product size depends on the
    a. feed rate
    b. rotor speed
    c. clearance between hammer & grinding plates
    d. all (a), (b) and (c)

19. For a cyclone of diameter 0.2 m with a tangential velocity of 15 m/s at the wall, the separation factor is
    a. 2250
    b. 1125
    c. 460
    d. 230

20. Addition of filter aid to the slurry before filtration is done to ..... of the cake.
    a. increase the porosity
    b. increase the compressibility co-efficient
    c. decrease the porosity
    d. decrease the compressibility co-efficient

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SECTION "B"

Attempt *ALL* questions.

1. a. From fundamentals state, derive the 3 laws of crushing. Define work index.
   b. What operating speed would you recommend for a ball mill 1200 mm diameter charged with 75 mm balls?
   c. Define equivalent diameter of an irregular particle. Calculate the equivalent diameter for a cube of unit length 'a'.
   d. Mention the different types of storage of solids. [4×2=8]

2. a. A certain crusher accepts a feed rock having mean diameter of 2 cm and discharge a product of mean diameter 0.5 cm. The power required to crush 10 tons/h is 8 HP. What should be the power consumption if the capacity is increased to 12 tons/h and the mean diameter is reduced to 0.4 cm? Use Rittinger's Law. [3]
   b. Discuss principles of cake filtration. Differentiate between constant pressure and constant rate filtration? [3]

3. a. With a diagram, explain the principle operation to working of a filter press. [3]
   b. A quartz mixture having the screen analysis shown in table is screened through a standard 20-mesh screen. The cumulative screen analysis of overflow and underflow are given in table. Calculate the mass ratio of the overflow and underflow to feed & overall effectiveness of the screen. [3]

Mesh	D_P (mm)	Feed (X_F)	Overflow (X_D)	Underflow (X_B)
4	4.699	0	0	--
8	2.362	0.15	0.43	0
10	1.651	0.47	0.85	0.195
20	0.833	0.885	0.99	0.83
35	0.417	0.96	--	0.94
Pan	--	1.00	--	1.00

4. Specify the factors which influence 'Rate of Mixing'.

   OR

   What are the various types of equipment's used for conveying of solids in chemical industries. [3]

5. Explain the methods of preventing swirling in agitated vessels.

   OR

   With the help of a neat sketch, explain the principle of belt conveyor. [3]

6. A filtration is carried out for 10 min at a constant rate in a leaf filter and there after it is continued at constant pressure which is attained at the end of constant rate period. If one quarter of total volume of the filtrate is collected during the constant rate period, what is the total filtration time? Assume that the cake is incompressible and the filter medium resistance is negligible.

OR

What should be the diameter of a set of roles to take feed of a size equivalent to 38 mm spheres and crush to 12.7 mm if coefficient of friction is 0.35?

[4]

7. The terminal settling velocity of a 6 mm diameter glass sphere (Density= 2500 kg/m^3) in a viscous Newtonian liquid (Density= 1000 kg/m^3) is 100 μm/s, if particle Reynolds number is small. Find the viscosity of liquid (in Pa.s)

OR

Explain the operation of a continuous rotary drum filter with the help of a neat sketch.

[4]

8. a. Name the resistances present in filtration operation. Give the characteristics of filter medium. [2]

b. Draw a fractional distribution curve and cumulative distribution curve from the following screen analysis. [4]

Mesh	Screen opening (micron)	Avg. particle size (micron)	Weight fractions retained
6/10	2362	2845	0.017
10/14	1168	1410	0.533
14/20	833	1000	0.217
20/35	589	711	0.167
35/48	295	356	0.028
48/100	208	252	0.027
100/150	104	126	0.005
150/200	74	89	0.002
Pan	--	--	0.004