



SE-8253

B. E. - III (Sem. V) (Chemical) Examination

April / May - 2011

Mechanical Operation

(New Syllabus)

Time : 3 Hours]

[Total Marks : 100

Instructions :

(1)

नीचे दशांशों में निशानीवाणी विगतो उत्तरवही पर अवश्य लिखनी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
← B. E. - 3 (SEM. 5) (CHEMICAL)	<input type="text"/>
Name of the Subject :	<input type="text"/>
← MECHANICAL OPERATION (NEW)	<input type="text"/>
← Subject Code No. : <input type="text" value="8"/> <input type="text" value="2"/> <input type="text" value="5"/> <input type="text" value="3"/>	← Section No. (1, 2.....) : <input type="text" value="NIL"/>
	Student's Signature

- (2) Attempt all the questions.
- (3) Figures to the right indicate full marks.
- (4) Assume suitable data wherever necessary.
- (5) Draw neat labelled diagrams.

1 (a) Attempt the following : 4×1=4

- (1) Sphericity of raschig ring (whose length and diameter are equal) is _____.
(a) > 1 (b) < 1
(c) 1 (d) 2
- (2) The main size reduction operation in ultrafine grinders is _____.
- (3) Trammels are revolving screens which normally operate in the range of _____ rpm.
- (4) Short distance transportation of grain, gravel, sand, ash, asphalt etc. is done by using a _____ conveyor.

(b) Do as directed : 3×2=6

- (1) What is size reduction ?
- (2) Define : Minimum Fluidization velocity.
- (3) Define : Screening.

(c) State and explain the different laws of size reduction 8
with the importance of the work index in the size reduction.

- 2** Attempt the following : (any **two**) **8×2=16**
- (a) Define fluidization. Explain the condition for fluidization with pressure drop and bed height Vs. Superficial velocity for bed of solids.
- (b) Calculate the operating speed of the ball mill from the data given below :
 Diameter of ball mill = 800 mm
 Diameter of ball = 60 mm
 If (i) Operating speed is 55% less than the critical speed.
 (ii) Critical speed is 40% more than the operating speed.
- (c) A material is crushed in 4 black jaw crusher and the average size of particles is reduced from 5 cm to 1.3 cm. with consumption of energy at the rate of 37 (watts) (hr.)/(metric ton). What will be the consumption of energy necessary to crush the same material of average size 8 cm to an average size of 3 cm ? The mechanical efficiency remain's unchanged.
 (i) Using Rittinger's law
 (ii) Using Kick's law.
- 3** Attempt the following : (any **four**) **4×4=16**
- (a) Explain mixers for cohesive solids
 (b) Vibrating screens
 (c) Open circuit and closed circuit grinding operation.
 (d) Determination of number of particles in a mixture.
 (e) Hammer mills and impactors.
- 4** (a) Answer the following : **10**
- (1) In relation with classifiers, explain sands and slimes.
 (2) For agitation, an expression for Reynolds number is _____.
 (3) Define : Angle of Repose.
 (4) What are hydroclones ? In which case they are used ?
 (5) Enlist zones of settling.

- (b) Calculate the settling velocity for hindered settling of glass sphere in water at 68°F when the suspension contains 1206 gm of glass spheres in 1140 cm³ of total volume. The average diameter of the sphere was 0.0061 inch and the true density of the sphere is 154 lb/ft³. Assume density of water as 62.2 lb/ftw³ and viscosity of water 6.72 ×10⁻⁴ lb/ft. sec. 8

5 Attempt the following : (any two) **8×2=16**

- (1) Explain in detail sink-and-float method with example.
- (2) A silty soil containing 14 percent moisture was mixed in a large nuller mixer with 10.0 wt. percent of a tracer consisting of dextrose and picric acid. After 3 min. of mixing, 12 random samples were taken from the mix and analyzed colorimetrically for tracer material. The measured concentrations in the sample were, in weight percent tracer, 10.24, 9.30, 7.94, 10.24, 11.08, 10.03, 11.91, 9.72, 9.20, 10.76, 10.97, 10.55. Calculate the mixing index I_p and the standard deviation S.
- (3) Compare pressure filter and vacuum filter.

6 Attempt the following : (any four) **4×4=16**

- (1) Write a short note on thickener.
 - (2) With a neat sketch explain working of a cyclone separator.
 - (3) Enlist the advantages of plate and frame filter press over the other filtration equipment.
 - (4) Explain pneumatic conveying.
 - (5) Write a short note on Banbury mixer.
 - (6) Compare sedimentation and centrifuge.
-