Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

PCCH 4204 (New)

Special Examination – 2012

MECHANICAL OPERATION

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.
Assume suitable notations wherever necessary.
Assume any missing data suitably

1. Answer the following questions : 2 ×10

   (a) Is sphericity independent of particle size ? Justify.

   (b) Discuss the properties of the material that affect the size reduction operation.

   (c) Define and explain Rittinger's number.

   (d) Explain how coefficient of friction and angle of nip are related.

   (e) Name the factors affecting the size of product obtained from a ball mill.

   (f) Write the factors affecting screen effectiveness.

   (g) The successive opening in the Tyler series screen is with a constant ratio of _____ .

   (h) Define drag coefficient and settling ratio.

   (i) Differentiate between constant pressure and constant rate filtration.

   (j) Why are idlers used in belt conveyors ?

2. (a) Find the sphericity of a cuboid whose length, breadth, and depth are in the ratio of 4 : 3 : 2. 5

   (b) What are the different mean diameters used to represent the particle size of a mixture ? Are all the mean diameters same ? Justify. 5

3. A sample of materials is crushed in a Blake jaw crusher, such that the average size of the particles is reduced from 60 mm to 12 mm with the energy consumption of 14 kW/(kg/s). Determine the consumption of energy to crush the same material of average size 80 mm to an average size of 27 mm using Rittinger's and Kick's Laws. 10

P.T.O.

4. A quartz mixture is screened through a 28-mesh screen. The cumulative screen analysis of the feed, overflow, and underflow are given in the following table.

Mesh	D_p, mm	Cumulative mass fraction greater than D_p		
		Feed	Overflow	Underflow
4	4.699	0	0	0
8	2.362	0.15	0.43	0
10	1.651	0.47	0.85	0.195
28	0.589	0.94	1.00	0.91
65	0.208	0.98	–	0.975
Pan	–	1.00	–	1.00

Calculate the mass ratios of overflow to feed and underflow to feed. Also calculate the overall effectiveness of screen. 10

5. (a) Discuss in detail with a neat sketch the construction and working of a vibrating screen. 5

(b) Discuss in detail with a neat sketch the construction and working of a Wilfley table. 5

6. (a) Discuss in detail with a neat sketch the construction and working of a fluid energy mill. 5

(b) Discuss in detail with a neat sketch the construction and working of a rotary drum filter. 5

7. (a) Find the drag coefficient for a boat moving in water at 15 cm/s. The size of boat is 2 m and kinematic viscosity of water is 10^{-6} m^2/s. 5

(b) Discuss in detail with a neat sketch the construction and working of a belt conveyor. 5

8. Write short notes on any **two** : 5×2

(a) Gyratory crusher

(b) Leaf filter

(c) Kneader

(d) Screw conveyor