Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

III SEMESTER B.TECH (CHEMICAL ENGINEERING)
END SEMESTER PROCTORED ONLINE EXAMINATIONS (POE), JANUARY 2022
SUBJECT: PARTICLE TECHNOLOGY [CHE 2154]
REVISED CREDIT SYSTEM

Time: 75 Minutes   (29/01/2022 AN)   Max. Marks: 20

Instructions to Candidates:
- ❖ **Answer all the questions.**
- ❖ **Each question carries equal marks (2 X 10 = 20).**
- ❖ **Missing data, if any, may be suitably assumed.**
- ❖ **Write specific and precise answers, Usual notations shall apply.**

1A.	Write the physical meaning and significance of specific surface area of particles in the sample mixture. How do you improve the effectiveness of screen while separating the particles in the feed mixture?	**[02]**
1B.	The following experimental results were obtained by crushing granite material in a Hammer mill. Weight of the feed is 2 kg, average size of feed is 15 mm. Energy meter reading is 3600 rev = 1 kw-hr. Under no load condition (before adding the feed) the disc takes 25 sec per revolution. Crushing duration of the disc is 15 sec per revolution. Total time required for both crushing and empty running is 75 sec. Calculate the Rittinger's law constant for the power required for crushing. The screen analysis data is given in the following table:	**[04]**

A	4	8	14	28	48	65	100	150	200
B	4.699	2.362	1.168	0.589	0.295	0.208	0.147	0.104	0.074
C	0	11.2	29.6	27.4	17.2	6.0	3.8	2.8	2

Where A = Mesh no; B = Screen opening (mm); C = Percentage retained (wt%)

1C.	The cement clinkers are ground by using the industrial scale ball mill and the product obtained from the grinder is screened using industrial screen. Explain the construction and working operation of the same equipment with suitable sketch. Also, to compare wet and dry grinding operation in a tumbling mill.	**[04]**
2A.	To determine the maximum diameter of continuous thickener to produce an underflow concentration of 40% by weight from a feed containing calcium carbonate ($CaCO_3$) concentration of 1.9083 lb/ft³. The flow to the thickener is to be 2.8784 x 10⁶ gal (UK) per day. The density of $CaCO_3$ was 2.63 g/cc. Assume that the density of water is 1 g/cc. The batch sedimentation test data is given below.	**[05]**

Z (cm)	32.4	26	18.5	8	4.5	3.6	3.4	3.2	3.1	3.0
θ (sec)	0	120	240	420	600	780	900	1020	1140	1260

Where Z= Height of settling interface (cm); θ = settling time (sec).

2B.	Prove analytically that the filtrate flowrate (Q_f) varies with speed (N) of rotary drum vacuum filter for the formation of compressible cake.	[02]
2C.	A Tubular bowl centrifuge is used to separate very fine particle from the feed stream and it is rotating at a speed of 12000 revolution/min. The centrifuge treats 3 lit per min of feed solution with satisfactory results. It is proposed to use the same centrifuge to separate contaminant particle from the effluent process stream. If the average size of the contaminant is one third that of the very fine particles and viscosity of the effluent process stream is the five times greater than fine particle in the feed stream. What flow rate can be handled, if the centrifuge is operated at the same speed? Assume that the density of both the particles were closely related.	[03

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