21718

3 Hours / 100 Marks   Seat No.

Instructions :
(1) All Questions are *compulsory.*
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data, if necessary.
(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1. **(A) Attempt any SIX of the following :**   **12**

   (a) State Rittinger's law and Kick's law.

   (b) Classify size reduction equipments.

   (c) Differentiate between ideal screen & actual screen.

   (d) Define Screening. State its two applications.

   (e) State the various types of impellers.

   (f) Define Classification. Name any two types of classifier used in process industry.

   (g) Define electrostatic separation.

   (h) State importance of mixing in process industries.

   (B) Attempt any TWO of the following :   **8**

   (a) Define critical speed of ball mill. Write its formula. State the criteria for selecting the operating speed of ball mill.

   (b) Draw a neat diagram of jaw crusher and name its parts. Explain construction.

   (c) Derive an equation for effectiveness of a screen.

2.   **Answer any FOUR of the following :**   **16**

   (a)   What is sphericity ? Write the formula to calculate it. State its significance.

   (b)   Compare grizzlies with trommels.

   (c)   What is trommels ? Draw trommel arrangement and explain its working.

   (d)   Draw the diagram of rake classifier.

   (e)   Explain cyclone separator with neat sketch.

   (f)   Explain cake filtration and deep bed filtration.

3.   **Answer any FOUR of the following :**   **16**

   (a)   What do you mean by closed circuit grinding and open circuit grinding ?

   (b)   Mention the factors affecting the performance of screen.

   (c)   Draw a neat sketch of drum separator for magnetic separation and explain in brief its construction.

   (d)   Explain the classification of filter on the basis of (i) driving force, (ii) mode of filtration.

   (e)   Explain working of rotary vacuum drum filter.

   (f)   Draw the neat sketch of washing type of plate and frame filter press.

4. **Answer any FOUR of the following :** 16

    (a) Draw the diagram of motion of screen :

        (i) Gyration in horizontal plane

        (ii) Gyration in vertical plane

        (iii) Shaking

        (iv) Mechanically vibrated

    (b) Explain with diagram ball Morton type separator.

    (c) What are the advantages and disadvantages of vacuum filter ?

    (d) What is the significance of cake resistance ? How is it denoted ? State one method of reducing cake resistance.

    (e) Distinguish between sedimentation and filtration.

    (f) Explain free settling and hindered settling processes.

5. **Solve any TWO of the following :** 16

    (a) Derive an expression relating size of crushing roll, size of feed, product size and angle of nip.

        A double roll crushes having a set of crushing rolls of 100 cm diameter and 35 cm width face are to be set so that the crushing surfaces are 1.4 cm apart at narrowest point. Find out the maximum permissible feed size to the crusher if angle of nip 32°.

    (b) What is froth floatation ? Explain with neat sketch, construction and working of flotation cell.

    (c) Explain with diagram Dorr thickener.

6. **Answer any FOUR of the following :** 16

   (a) What are the factors affecting rate of filtration ?

   (b) What is swirling and vortex ? Explain method of prevention of swirling & vortex formation.

   (c) What is mixing ? Explain Homogeneous and Heterogeneous mixtures.

   (d) Explain the construction and working of Sigma mixer.

   (e) Explain the construction and working of Muller mixer.

   (f) A six-blade turbine agitator of diameter 60 cm is installed centrally in tank with flat bottom of diameter 180 cm. at a height of 60 cm from the bottom. The tank is filled with a solution of viscosity. 10 C_p and of 1.45 g/ml density. The speed of agitation is 90 rpm. The tank is baffled. Calculate the power required.

   Data : power number = N_p = 1.05 for N_{Re} > 300

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